Identifying undergraduate pharmacy students' achievement goals and their effects on academic achievement and teachers' qualities

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STATEMENT OF AUTHENTICATION

This thesis is submitted to the University of Sydney in fulfilment of the requirements for the Degree of Doctor of Philosophy.

The work presented in this thesis was conducted under the supervision of Dr Lorraine Smith and Dr Erica Sainsbury and is, to the best of my knowledge, original except as acknowledged in the text. No part of this work has been submitted, in part or in full, towards the award of another degree at this or any other institution.

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Contents

LIST OF ABBREVIATIONS

AGQ	Achievement Goal Questionnaire
AGQ-R	Achievement Goal Questionnaire – Revised
AGT	Achievement Goal Theory
AHPRA	Australian Health Practitioner Regulation Agency
APC	Australian Pharmacy Council
ATAR	Australian Tertiary Admission Ranking
BPharm	Bachelor of Pharmacy
CPD	Continuing Professional Development
IELTS	International English Language Testing System
MPharm	Master of Pharmacy
PALS	Patterns of Adaptive Learning Scales
PBA	Pharmacy Board of Australia
PCAT	Pharmacy College Admission Test
PharmD	Doctor of Pharmacy
PITP	Pharmacy Intern Training Program
PSA	Pharmaceutical Society of Australia

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CONFERENCE PRESENTATIONS

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ABSTRACT

The work for this thesis started with generic questions about achievement motivation and its application in pharmacy education settings. Questions like: what are pharmacy students' preferred achievement goals? Are there any relationships between these achievement goals and academic performance? Is there any relationship between exam types and adopted achievement goals? Is student motivation in any way related to the qualities they value in their teachers? Such questions have guided this doctoral work since August 2010.

For more than three decades, achievement goal theory has been one of the most influential theories investigating students' motivation to learn (Conley, 2012). Four types of achievement goals have been identified by scholars (Huang, 2012; Hulleman et al., 2010): (1) mastery-approach, where individuals strive to understand and learn the tasks and material at hand as thoroughly as possible; (2) mastery-avoidance, where the individual's aim is to avoid not understanding and learning the task thoroughly; (3) performance-approach, where the individual's aim is to demonstrate superior performance compared to one's peers; and (4) performance-avoidance, where the individual strives to avoid the demonstration of a perceived lack of ability or avoid appearing less talented than others.

In order to begin to answer the above questions, a qualitative study was undertaken to investigate first year students' and teaching academics' expectations and perceptions of the university learning environment, including students' preferences for what they expect and value in their teachers. The

findings of this study yielded some important preliminary insights regarding learning and teaching in the Faculty of Pharmacy at the University of Sydney, Australia.

From this preliminary work emerged the chief aims of the program of doctoral work – 1) to investigate achievement goals in pharmacy students and their relationships to academic achievement both cross-sectionally and longitudinally; 2) to tease out the influence of ethnic background on goal orientation and academic achievement; and 3) to examine the relationships between achievement goals, assessment type and academic performance. A further aim was 4) to examine the effects of goal orientation on students' preferences for teachers' qualities.

A two-step psychometric validation of two measures of achievement goal orientations was undertaken first of all. The first analysis was conducted by sampling pharmacy students from the Faculty of Pharmacy at the University of Sydney, Australia, and in the second analysis, pharmacy students from four countries (England, New Zealand, Wales and United States) were further sampled to confirm the replicability of the instrument in comparable pharmacy education settings. The outcome of this validation study was a robust instrument suited for research into pharmacy student achievement goals. This process paved the way for a further four studies.

The first study sought to identify Australian undergraduate pharmacy students' achievement goals and their relationship to both academic achievement and ethnicity, and to conduct a cross-sectional analysis of two cohorts. The second study followed these two cohorts (Cohort I from year one to year two

and Cohort II from year three to year four) to assess the extent to which students' goal orientations changed over time.

The third study investigated the relationship between achievement goals, academic performance and assessment types in undergraduate pharmacy students, again with international participation by pharmacy cohorts from four countries; England, Wales, New Zealand and Australia. The fourth and final study aimed to examine how pharmacy students' adopted achievement goals might influence their preferences regarding the qualities they would like to see in their teachers.

The outcomes of these studies provide important and novel findings regarding students' perceptions and preferences regarding their motivations for learning; the significance of validating apparently robust measuring instruments for local conditions; the importance of avoiding global measures of academic achievement when studying their relationship with achievement motivation ; the significant role that ethnicity plays in student achievement motivation; and how students' achievement goals influence their preferred teaching styles of their teachers.

This is the first project of its kind conducted into undergraduate pharmacy students' achievement goal orientations and academic performance. The implications for pedagogical practices are discussed.

Chapter 1: Pharmacy and Pharmaceutical Education

1.1 Introduction

Pharmacy is found in almost all civilizations throughout history because it fulfils one of humanity's basic safety needs for security of health and wellbeing (Kremers and Sonnedecker, 1986; Maslow, 2013). Pharmacy has a long, rich history. Archaeologists have found fossils from medicinal plants alongside remains of Neanderthals, indicating that early man used plants as drugs around 50,000 BC (Pharmaceutical Society of Australia, 2014b). The first prescription of which we have a record was discovered in Egypt and dates back to 3700 BC (Wootton, 1910). The Egyptians were renowned for their documents depicting their pharmaceutical preparations. One of the most famous such documents is the Ebers Papyrus, which dates back to 1552 BC. This papyrus, which is 22 meters long and about 30 centimetres wide, describes approximately 700 medications from both plant and animal origins (Gordetsky and O'Brien, 2008; Wootton, 1910).

The Greeks had much to add as well. Hippocrates (460–377 BC), known as the "father" of medicine, mentioned about 200 to 400 drugs in his writings, along with some methods for pharmaceutical processes. Theophrastus (370–385 BC) wrote about medicinal plants (i.e., pharmacognosy) as well as pharmacology (Scarborough, 1978). Another example of the Greeks' contribution to pharmacy is Galen, who created a system of pathology and therapy that governed and influenced Western medicine for 1500 years (Pötzsch, 1996; Pharmaceutical Society of Australia, 2014b).

According to Al-Ghazal and Tekko (2003), pharmacy as a profession separate from medicine was established in the ninth century in Baghdad, where there were private pharmacy shops run by skilled pharmacists who were knowledgeable in compounding and storing medications. In Baghdad, the pharmacy shops were under regular inspection from the government, which appointed officials to check the purity of the medications used (Al-Ghazal and Tekko, 2003; Pötzsch, 1996).

In Great Britain, pharmacy as a separate entity from medicine emerged when King James I of England granted the apothecaries a Royal Charter in 1617 (Haines, 1988). This charter gave apothecaries the right to own pharmaceutical shops. However, it was not until 1841 that the Pharmaceutical Society of Great Britain was formed, with the aim to “unite the profession into one body, to protect its members' interests and to advance scientific knowledge” (Royal Pharmaceutical Society of Great Britain, 2014).

1.2 Pharmacy in Australia: A Brief History

Australia is a country in the Asia Pacific region with a population of approximately 23 million people (Australian Bureau of Statistics, 2014) and occupying roughly 7 million square kilometres of land. It comprises of six States (New South Wales, Queensland, South Australia, Tasmania, Victoria, and Western Australia) and two Territories (Australian Capital Territory and Northern Territory), which were federated on the 1 January 1901, forming the Commonwealth of Australia.

Australian indigenous people had extensive botanical knowledge and used a large number of plants for medicinal purposes (Lassak and McCarthy, 2011).

However, due to poor documentation, many of the aboriginals' traditional remedies have not found their way into contemporary pharmacopeias (Wohlmuth et al., 2002).

The first non-indigenous medical professional to land on Australia's soil was a Dutch apothecary in 1629 (Leavesley, 1995). Jeronimus Cornelisz was an apothecary by training, and sold his tablets in Haarlem, Holland (Pharmaceutical Society of Australia, 2014c). According to Leavesley (1995), Jeronimus abandoned his profession at age 30 to become a worker in the Dutch East India Company.

In 1770, Captain James Cook arrived into Botany Bay, Sydney and claimed the east coast of Australia for Britain (Beaglehole, 1974). Eighteen years later, Captain Arthur Phillip led the First Fleet into Sydney in 1788 and started the first British colony in Australia (Pembroke, 2013).

In 1820, a Medical Board was established to verify the competence of anyone wishing to practice as a pharmacist (Pharmaceutical Society of Australia, 2014c). This board granted John Tawell a certificate to practice as an apothecary, being someone who can compound and dispense medications to the public (Low et al., 2009). According to Low et al. (2009), Mr. Tawell opened the first apothecary shop in Sydney in 1820, which was very successful. In 1845 Tawell retired and returned to England, where he was executed for poisoning his mistress.

The first pharmacy shop was opened in the state of Tasmania in 1825 by Michael Bates, a pharmacist from Yorkshire, England (Finch, 1991).

According to the same author, the first medical licensing and registration body in Australia was established in Tasmania in 1842, and the first registered pharmacist was Landon Fairthorne, who received his license for practice in Hobart, Tasmania, in 1846.

The first pharmaceutical society in Australia was established in Sydney in 1844 and was named the Pharmaceutical Society of New South Wales. This society did not survive, but it opened a door to forming similar societies (see Table 1) across different states in Australia (Haines, 1988).

Table 1. Foundation of pharmaceutical societies in Australia

State	Date of society creation
Victoria	1857
New South Wales	1876
Queensland	1880
South Australia	1885
Tasmania	1891
Western Australia	1892

(Adapted from Pharmaceutical Society of Australia, 2014c)

In the other Australian states, other famous names have a long history with the profession of pharmacy, such as Francis Hardy Faulding, who established a drug company in Adelaide, South Australia (Carter et al., 1940), and Barry Cotter, the first medical practitioner and pharmacist in the state of Victoria (Dammery, 2001).

In this period, apart from the state of Tasmania, there were no regulations on the pharmacy profession, and many claimed to be pharmacists without actually having a background in the profession (Haines, 1988). Thus, under pressure both from the public and from qualified pharmacists, the other states of Australia established a licensing system for selling medications and poisons (Pharmaceutical Society of Australia, 2014c). Although all licensing systems in Australia were based on their counterparts in Britain, there were some differences (Haines, 1988). For example, in Western Australia, membership of the Pharmaceutical Society was a compulsory pre-requisite for registration (Haines, 1988).

In 1977, the Pharmaceutical Society of Australia (PSA) was formed with the aim of improving Australians' health through excellence in the practice of pharmacy and to bring the different states' pharmaceutical societies together under one umbrella (Pharmaceutical Society of Australia, 2014d). The PSA's objectives are as follows:

1. Building capability through practice support and professional development.

2. Positioning pharmacy for the future through innovative and sustainable models of practice.

3. Creating optimum conditions for excellence through advocacy.

4. Ensuring organizational effectiveness and sustainability (PSA, 2014d).

The PSA is not intended to interfere with the autonomy of the different states' pharmaceutical societies; however, all of these local societies accept the directions and guidelines of the PSA National Council (Pharmaceutical Society of Australia, 2014).

1.3 Pharmaceutical Education

One of the fundamental means of building up a professional reputation is by education (Kremers and Sonnedecker, 1986). In this section, a brief history of pharmaceutical education in Europe, United States and Australia is presented. Choosing Europe and United States in this review is based on the rich history that these countries have in pharmacy education. Reviewing the pharmacy education in Australia is essential as most of the studies were conducted in the Faculty of Pharmacy at the University of Sydney, Sydney, Australia. Finally, a focus on pharmaceutical education at the University of Sydney concludes this section.

1.3.1 Europe

In Europe, university education began in the 11th century with the University of Bologna, Italy (1088), followed by the University of Paris (1110), University of Oxford (1167), and University of Cambridge (1226) (Zalai, 1986; Rashdall, 2010; University of Oxford, 2014; University of Cambridge, 2014). Medical education, however, did not start in universities, but instead was centred around schools such as the medical school at Salerno in southern Italy, founded in 846 and converted to a university in 1231 (Encyclopaedia Britannica, 2014; Zalai, 1986). In this university, pharmacists and physicians were taught about medicinal plants and their effects on many diseases. In fact, at this time, pharmacy education was a part of medical education in Europe (Zalai, 1986).

The establishment of formal universities in Central Europe did not begin until the 14th century with the founding of, for instance, Charles University (also known as the University of Prague) in 1348, the University of Vienna in 1365, and Heidelberg University (also known as Ruperto Carola) in Germany in 1386 (Charles University, 2014; Heidelberg University, 2014; University of Vienna, 2014).

In central Europe, the first early education and supervision of pharmacists took place at Charles University (Zalai, 1986). According to the author, all Prague’s pharmacist were required to swear an oath of proper conduct in their profession to the rector and register on the university roll.

The first figure to organize pharmacy education was Francesco Buonafede in Padua, Italy, in 1533. He established a botanical garden and taught future pharmacists the potential benefits of medicinal plants (Greene, 1983). The first organized program intended to produce graduate pharmacists in Central Europe was established in 1783 at the Jagiellonian University, Krakow, Poland (Zalai, 1986). In this two-year course, students studied medicinal plants, chemistry and compounding (Roeske, 1983). Face-to-face lectures were the primary way of teaching students at these times (Zalai, 1986).

Although pharmacy education began in the 17th century as an apprenticeship system in Great Britain, it was not until 1842 that the first school of pharmacy opened in London (Anderson, 2005). At this school, now the School of Pharmacy at the University of London, chemistry was a foundation subject, in addition to medicinal plants, *materia medica* and compounding (Anderson, 2005). The School of Pharmacy, at this time, granted two certifications: the Chemist and Druggist’s Diploma, for community pharmacists, and the more prestigious Diploma of Pharmaceutical Chemistry, for graduates who wished to work in hospitals or pharmaceutical factories (Kremers and Sonnedecker, 1986). Learning and teaching at this school was in Latin and comprised lectures and chemistry lab work (Anderson, 2005). According to the author, a pharmacy student needed to pass several exams before being registered as a pharmacist in the UK.

The North London School of Chemistry and Pharmacy was the first private pharmacy school. Its doors were opened in 1870 by J. C. Braithwaite, a former teacher at the School of Pharmacy (Anderson, 2005; Crookes, 1873). According to Anderson (2005), this private school was opened for apprentices who would not have a chance to enter the School of Pharmacy in London.

The industrial revolution that occurred in the 19th century had its impact on pharmacy education (Zalai, 1986). Pharmacy schools around Europe had to include subjects on aspects of pharmaceutical manufacturing such as drug stability, drug control and technology (Zalai, 1986). Due to the increased number of pharmaceutical preparations that were produced by pharmaceutical factories in the early 20th century, students had to focus on the pharmacological aspects of the medications. Pharmacology is a science also based on other subjects such as biology, physiology, anatomy and pathology, which became compulsory subjects for pharmacy students during this time.

From the 20th century onward, curricula and length of study for pharmacy degrees have changed dramatically. In the UK, for example, a milestone in pharmacy education occurred when the University of London introduced a two-year Bachelor of Pharmacy (BPharm) degree in 1924, only to replace it with a three-year honours degree in Pharmacy in 1946 (Anderson, 2005). From 1946 to 1983 there were four main departments at pharmacy schools: Pharmacology, Pharmaceutics, Pharmacognosy and Medicinal Chemistry. However, in 1986 a report was generated by a Nuffield Foundation committee set up to examine pharmacy curricula in UK; the report argued that the traditional four pharmacy departments were not suitable for the future of education in the discipline, and recommended that subjects taught at pharmacy schools be grouped with each other to demonstrate relevance (Nuffield Committee of Inquiry into Pharmacy, 1986). Further, the committee asked all schools to include aspects of clinical pharmacy in their curricula.

The ramifications of this report were not trivial. From 1997, a four-year program leading to a Master of Pharmacy (MPharm) degree was introduced (Anderson, 2005). Students who successfully complete this program then take an additional postgraduate year under the supervision of a registered pharmacist, and sit an exam set by the Royal Pharmaceutical Society of Great Britain in order to be registered as a pharmacist in the UK (Anderson, 2005; Sosabowski and Gard, 2008).

1.3.2 The United States of America

The first pharmacy shop in the US was probably opened in Boston, Massachusetts by William Davis in 1646 (Allen, 2013). For more than 30 years, Mr. Davis was the US's source of foreign medications, which he imported from the UK (Gevitz, 1999). However, the first recorded evidence dealing with medications dates back to 1698 (Kremers and Sonnedecker, 1986). This record, an account book of Bartholomew Browne of Salem, records around 200 medications that are chemical in nature (Griffenhagen, 1961).

As in Europe, pharmacy in the US was first practiced by physicians who also diagnosed and dispensed medications (Kremers and Sonnedecker, 1986). However, in 1776, Dr John Morgan, the Chief Physician of Massachusetts, prohibited physicians from dispensing medications, asking them to consult pharmacist Andrew Craigie and send him all prescriptions (Worthen, 2002). From this date, pharmacy emerged as a separate profession in the US.

In 1765, Dr Johan Morgan was appointed as the first teacher in pharmacy in the US (Kremers and Sonnedecker, 1986). Although he was a physician, he also taught pharmaceutical chemistry and *materia medica* at the Medical School of the College of Philadelphia, Pennsylvania, founded in 1765 (Lawall, 1926). According to Lawall (1926), Philadelphia is a “city of firsts” in everything that concerns pharmacy. He argues that the first school of pharmacy, the first pharmacopeia, the first code of ethics, the first drug factory, the first pharmaceutical journal, the first glycerine, the first sugar-coated tablets produced in large scale, and the first laboratory for anti-toxins were all in Philadelphia.

The first college of pharmacy, the Philadelphia College of Pharmacy, opened its doors in 1821 (Lawall, 1926). The curriculum at this college was mainly concerned with teaching biological and chemical sciences (England, 1922). Students graduating from this school had to finish a prescription course and pass examinations. Teaching at this college comprised face to face lectures and practice labs for chemistry and pharmaceutics. This college was followed by other schools of pharmacy around the US, for example, the School of Pharmacy at the University of Michigan in 1868, the School of Pharmacy at the University of Illinois at Urbana-Champaign in 1876, and the School of Pharmacy at the University of Wisconsin in 1892 (Higby et al., 2001).

In 1900, the length of pharmacy programs ranged from two to four years, and admission requirements varied considerably between schools, some of which accepted students with elementary or grammar education while others accepted only high school graduates (Buerki, 1999). However, in 1932 all schools had to change their programs to four-year programs, in line with the first four-year program established at the School of Pharmacy of the University of Illinois at Urbana-Champaign in 1876 (Higby et al., 2001).

After 1900 and in the first half of the 20th century, pharmaceutical sciences witnessed a remarkable development (Swann, 2001). It was during this period in pharmacy education that links were forged between the disciplines of medicinal chemistry, pharmacology, and pharmaceutics (Higby et al., 2001). Chemistry as a field was the dominant subject in the pharmacy curriculum, and had great acceptance among academics. Pharmacology, on the other hand, was resisted by many teachers, who saw it as outside of the scope of pharmacy. However, after World War II, pharmacology became an essential subject in most pharmacy schools (Higby et al., 2001; Swann, 2001).

By 1953, the introduction of enormous numbers of medications and the need to include social and cultural subjects in pharmacy school curricula drove the National Association of Boards of Pharmacy to adopt a five-year program as the minimum requirement for a Bachelor degree in pharmacy (Howe, 1953).

Although California schools of pharmacy had offered a six-year Doctor of Pharmacy (PharmD) program since 1952 (Higby et al., 2001), it was not until July 1992 that the PharmD became the sole degree required to enter the pharmacy profession (Buerki, 2002). This shift in US pharmacy education requirements has many reasons. The increase in the production of generic medications and the availability of many alternatives led some educators to urge pharmacy schools to expand their curricula to produce graduate pharmacists who could effectively help physicians select from the various medications in the market (Buerki, 2002). Yet, the main reason for such a shift, in Buerki's (2002) opinion, is the dramatic change in the philosophical view of the role of pharmacists in the US. The vision for the pharmacist's role had changed from a product-oriented person to a patient-oriented person who delivers pharmaceutical care (Buerki and Vottero, 1996; Hepler and Strand, 1989; Kalman and Schlegel, 1979). By focusing on patients instead of drugs alone, pharmacy schools shifted their curricula to cover more clinical and therapeutic aspects of pharmacy, such as anatomy, physiology, pathology, biochemistry, pharmacokinetics, communication skills and pharmacotherapies in addition to analytical chemistry and pharmaceutical subjects (Buerki, 2002).

Now, for students to enter a school of pharmacy in the US, they must complete compulsory subjects such as biology, chemistry, physics and calculus prior to applying for a four year PharmD program (American Association of Colleges of Pharmacy, 2014). In addition, all students must sit the Pharmacy College Admission Test (PCAT), which is specifically designed to measure whether candidates' possess the necessary ability and scientific knowledge for embarking on a pharmacy education (American Association of Colleges of Pharmacy, 2014).

1.3.2 Australia

Formal pharmacy education has been established in Australia for more than 125 years (Marriott et al., 2008). Before this, pharmacists were educated through an apprenticeship system; however, this has evolved into the current high-standard tertiary programs that produce highly qualified pharmacists with advanced clinical and pharmaceutical skills (Marriott et al., 2008). Official pharmacy degree programs started in Australia in 1960, when The University of Sydney established the first 3-year BPharm program in the country (Faculty of Pharmacy, 2013). The BPharm degree underwent a number of significant further developments in the 1990s and in 1997 the degree was converted to a four-year program. In response to the needs of the workplace and higher education environments, a 2 year graduate entry MPharm program was introduced in 2003.

Nowadays, the minimum requirement for registration as a pharmacist in Australia is four years of undergraduate study toward a BPharm degree or the equivalent of a two-year MPharm, followed by a 12-month internship under the supervision of a registered pharmacist (Pharmacy Board of Australia, 2010). The Bachelors and Masters curricula are accredited by the Australian Pharmacy Council (APC) using Accreditation Standards last revised in 2012 (APC, 2012). It consists of 36 standards, 11 of which (standards 17-27) relate to the curriculum, and sets out six pharmacy learning domains to guide curriculum development and delivery. The Standards are not meant to be a rigid blueprint for all pharmacy schools in the country, but have been designed to give a high degree of flexibility to each school to create its own curriculum within the broad standards (Appendix 1).

In general, the first year of the Bachelor program consists of foundation subjects such as physics, organic chemistry, biology, and social sciences (see, for example, The University of Sydney, 2014-a). These subjects then lead in to more advanced subjects such as pharmacology, pharmacokinetics and therapeutics. All pharmacy programs in Australia must include “experiential placements” in their curriculum in order to be accredited by the APC (2012). The aim of the experiential placement program is to help students develop their communication and clinical skills for professional practice as well as expose them to the role, ethics and responsibilities of the profession (APC, 2012).

The alternative pathway to registration as a pharmacist is the graduate-entry MPharm programs which have been introduced since 2003 (Marriott et al., 2008). These programs, which offer six semesters of study over a two-year time frame, provide new pathways for students who already hold Bachelor degrees in related medical or scientific fields and wish to become pharmacists (Marriott et al., 2008). The curricula of these accelerated programs is similar to those of the Bachelor degree programs, especially in the final two years (Marriott et al., 2008).

For graduates of both programs (i.e., the undergraduate and graduate programs), a 12-month internship in an approved setting (usually either hospital or community pharmacy) under the supervision of a Pharmacy Board-approved preceptor pharmacist is a compulsory requirement for registration. Interns must also complete an approved Pharmacy Intern Training Program (PITP) and pass two examinations prior to becoming fully practising professionals.

At the time of writing, all pharmacy interns in Australia are required to complete a minimum of 1824 hours of supervised practice while concurrently completing the PITP (Pharmacy Board of Australia, 2010). The PITP provider works with the intern and preceptor to assist the progression of the intern towards competent unsupervised practice as outlined in the National Competency Standards Framework for Pharmacists in Australia (Pharmaceutical Society of Australia, 2010). Once interns have completed at least 30% of the supervised practice hours (i.e. 548 hours), they may attempt the APC Written Examination, which is offered seven times a year and consists of 125 multiple choice questions on law, ethics, calculations, primary care and clinical therapeutics. The final assessment prior to attaining general registration is an oral examination conducted on behalf of the Pharmacy Board of Australia (PBA) by the Australian Health Practitioner Regulation Agency (AHPRA). This examination may be attempted after an intern has obtained a pass in the APC Written Examination and completed at least 75% of supervised practice hours (i.e. 1368 hours). This regimen of supervised practice, training and assessment is designed to produce knowledgeable and competent pharmacists who are able to apply their learning to professional practice.

To maintain their competency and to meet the requirements of the PBA for continued registration, all pharmacists (including interns) are required to complete at least 40 credits of Continuing Professional Development (CPD) each year (Pharmacy Board of Australia, 2011, 2013). Pharmacists are also required to maintain Professional Indemnity Insurance and recency of practice, and to report any criminal convictions to the PBA (Pharmacy Board of Australia, 2011).

Currently, no pharmacy school in Australia offers a professional PharmD degree which could lead to registration as a pharmacist, and the legal framework in Australian pharmacy education would need to be revised in order to allow this to occur. However, many pharmacy schools do offer clinical degrees in pharmacy, including a Master of Clinical Pharmacy, and Doctor of Clinical Pharmacy (see, for example, Monash University, 2014; The University of Queensland, 2014; The University of Western Australia, 2014; University of South Australia, 2014). In addition to these degrees, many universities offer degrees such as Masters and PhD by research in almost all pharmaceutical fields.

Many schools of pharmacy in Australia have established research and training programs for their students and work in partnership with hospitals and community pharmacies, which has led to the high standard of healthcare provided by both hospital and community pharmacists (Marriott et al., 2008). The balance and integration among foundational sciences, pharmaceutical sciences, social sciences and clinical education is one of the characteristics of Australian pharmacy education (Marriott et al., 2008). This balance and integration enables students to appreciate what they learn and relate the knowledge they gain to the real world.

At the time of writing, there are 18 pharmacy schools in Australia offering 23 accredited BPharm or MPharm degrees (Australian Pharmacy Council, 2013).

1.4 Pharmacy Education at the University of Sydney

The University of Sydney has a rich history in pharmacy education that can be traced back to 1899 (Faculty of Pharmacy, 2013). According to the University’s archives, Mr. Thomas Dixson was a lecturer in Materia Medica and Therapeutics in 1899. His 10 lecture course was divided into two parts; the first one, “which aimed to teach the pharmacological properties of some medicinal plants was intended for both Medical and Pharmaceutical students, and the second part which aimed to teach students the method of collection of medicinal plants was devoted only to pharmaceutical students” (The University of Sydney, 1899).

Although pharmacy education and research can trace their roots back to 1899, research in pharmacy essentially started in 1949 with the arrival from the Burroughs Wellcome Laboratories of Roland H Thorp as Professor of Pharmacology and Director of Pharmaceutical Studies (Faculty of Pharmacy, 2013).

Teaching and learning of pharmacy continued to develop through the 1950s. At that time, according to a conversation on 20th June 2014, Mr B. Dash (Dash, 2014) confirmed that, students had to attend a three-year part time program and pass the New South Wales Pharmacy Board Exam in order to qualify as a pharmacist. Mr. Dash confirmed that the subjects included Botany, Medicinal Chemistry, Pharmacology and Materia Medica, and students at this time had to attend three lectures and one-three hour lab for each subject.

Pharmacy education has evolved and continued since the introduction at The University of Sydney of the first three-year BPharm program in Australia in 1960 to the current four-year Bachelor program (Faculty of Pharmacy, 2013; Ryan et al., 2009). Since its inception, the BPharm program has undergone much revision, with significant changes introduced at regular intervals. The creation of the four year program in 1997 was a landmark event, and marked a major change in the philosophy and delivery of pharmacy education. The curriculum introduced in 1997 was based on three disciplines: pharmaceutical chemistry, pharmaceutics and pharmacy practice (Ryan et al., 2009). It followed the traditional model for the first three years, focusing in first year on biology, chemistry, mathematics, and foundation subjects in pharmacy; in second year on biomedical and pharmaceutical sciences, including medicinal chemistry, biochemistry, pharmacology and pharmaceutics; and in third year on more advanced pharmaceutical sciences and the practice of pharmacy. The addition of a fourth year allowed students to gain a much wider experience of the clinical and therapeutic features of pharmacy practice, including more extensive experiential placements which facilitated application of students' university learning (Ryan et al., 2009).

While the four year curriculum allowed greater opportunities for application, however, the discipline-based approach was still associated with little correlation between the different disciplines (Ryan et al., 2009). In order to enhance integration among different disciplines, Ryan and his colleagues (2009) undertook a comprehensive curriculum review for the BPharm program and created a new curriculum for the faculty after investigating best practice standards in countries like the US, UK, Netherlands, and Canada, and using data derived from both faculty members and students regarding the previous curriculum.

The main feature of the new curriculum, rolled out from first year in 2008, is its teaching approach, which adopts a more integrated perspective in contrast to the previous discipline-based approach (Ryan et al., 2009). The new curriculum centres around themes (i.e. basic and pharmaceutical sciences, professional practice in pharmacy, personal and professional development, and society and pharmacist) and is supported by a set of learning outcomes that describe the knowledge, skills, and behavioural milestones to be attained in each academic year of the curriculum (Ryan et al., 2009).

In the new curriculum, general biology have been replaced with molecular biology to the first year in addition to the basic sciences such as chemistry and biology. According to Ryan et al. (2009), this replacement is essential to provide a base on which pharmacogenomics courses can be taught in the future. In addition, mathematics and statistics have been integrated into course units from year one to year three, instead of teaching these subjects as separate courses. In this way, students can appreciate the importance of such topics in real clinical and pharmaceutical settings (Ryan et al., 2009).

In year two, medicinal chemistry and biochemistry have been integrated to form a course that focuses on the macromolecular targets of drug design (Ryan et al., 2009). Teaching in years three and four is based around body systems and is integrated across all the old disciplines. Case studies and problem-based learning are being used as preferred approaches in these two years (Ryan et al., 2009). In the first semester of the fourth year, the curriculum remains focused on developing students' therapeutic and clinical skills. The curriculum in the second semester of the final year provides students with opportunities to participate in international exchange programs or to specialize in particular pharmacy settings (Ryan et al., 2009). In addition, students can undertake an honours program in which they complete a significant piece of independent research under the supervision of a member of academic staff in the fourth year (The University of Sydney, 2014a).

Besides the BPharm degree, the Faculty of Pharmacy has also offered a MPharm degree since 2004 and Master and Doctor of Philosophy degrees by research in many pharmaceutical disciplines such pharmacy practice, clinical pharmacy, pharmaceutics and pharmacy education.

The results achieved during the final years of high school are key admission criteria for students to the BPharm. These scores are converted to a percentile score (ranging from 0 to 99.95) in the form of the Australian Tertiary Admission Ranking (ATAR) in order to maintain equity. This percentile score ranks students against each other in a normative manner. For example, if a student has an ATAR score of 80.00, it means that he or she has achieved as well as or better than 80% of Year 12 school leavers (Tertiary Institutions

Service Centre, 2014). The competitiveness of entering the Faculty of Pharmacy at the University of Sydney is indicated by the fact that the ATAR cut-off score for 2014 was 90.05 (The University of Sydney, 2014b).

Students who hold an international high school certificate may apply to the program provided that their grades meet both the minimum required high school scores and English language scores (The University of Sydney, 2014c). English is the only language of instruction at the Faculty. Thus, proficiency in English writing, reading and speaking is essential. To insure such proficiency, all international students must achieve a minimum result of 6.5 overall and a minimum result of 6.0 in each band of the International English Language Testing System (IELTS), or a minimum result of 577/677 overall including a minimum result of 4.5 in writing in the Test of English as a Foreign Language (TOEFL) paper-based exam, or a minimum result of 90 overall including a minimum result of 22 in reading, listening and speaking and 23 in writing in the Internet-based TOEFL (The University of Sydney, 2014c).

The student population at the Faculty of Pharmacy is very diverse, representing different heritages and backgrounds such Anglo, Chinese, Korean, Vietnamese, Indian and Arabic (Alrakaf et al., In Press-b). Table 1 highlights the number of Australian Undergraduate pharmacy students' languages spoken at home.

Table 2. Languages spoken at home

Language	Percentage
English	39.0%
Chinese (mainly Mandarin and Cantonese)	27.0%
Korean	13.6%
Vietnamese	8.5%
Arabic	5.1%
Other	6.8%

Adapted from (Alrakaf et al., In Press-b).

More than 40 academics from different cultural and academic backgrounds are currently employed as full-time staff within the Faculty. Besides their teaching and research responsibilities, they supervise 119 postgraduate research students (Chan, 2014).

In summary, pharmacy evolved over centuries and every culture had their input to this profession. Along with pharmacy, teaching of this profession took many different approaches. Initially, the teaching and learning was in the form of apprenticeship, then in Central Europe, lectures were begun in order to educate students about medicinal plants and compounding. The U.K, USA and Australia followed the same example.

Current pharmaceutical education systems differ across the western countries. In the UK and Australia for example, a four-year program followed by a 12 months of training is needed for registration as a pharmacist. However, in the US, a DPharm degree is needed to practise the profession.

The University of Sydney was the first university to offer pharmacy education to students in Australia.

Over the decades, the BPharm curriculum and teaching has been developed to foster student learning, and the demonstration of this learning through academic assessments. The motivational underpinnings of this learning, and its relationship with academic performance has been, to date, an unknown.

This chapter has briefly summarised key elements of the history and current practices of pharmaceutical education in some countries, however little has been discussed about the student perspective. Questions such as what motivates pharmacy students to engage in academic activities, and the effects of different types of motivation on their approaches to study and academic outcomes will be discussed in detail in the next chapter.

Chapter 2: Achievement Goal Theory

2.1 Introduction

This chapter has eight sections which will review the main issues surrounding achievement goal theory. The purpose of this discussion is to provide a platform for appreciating and interpreting the studies included in this thesis.

Types of goals, in general, and achievement goals in particular are discussed in Section 2.2, followed by the history of achievement goals and its developments over the past decades in Section 2.3. Section 2.4 deals with the various types of achievement goals and their relation to various educational aspects such as academic achievement, anxiety and learning strategies. Section 2.5 discusses the role of achievement goals in education and particularly in higher education. Section 2.6 discusses the multiple goal perspective and the debate around it. Different views about achievement goal constructs are discussed in Section 2.7. In Section 2.8, different approaches to measuring achievement goals are discussed with a focus on three instruments named: Achievement Goal Questionnaire, Pattern of Adaptive Learning Scales and the Revised-Achievement Goal Questionnaire. Recent directions that scholars are currently taking regarding achievement goals are highlighted in section 2.9.

2.2 Types of goals

Although researchers define goals as representations of desired outcomes (Austin and Vancouver, 1996; Harackiewicz and Sansone, 1991), goals can be viewed as specific or general or somewhere in between these (Pintrich, 2000a). Specific goals are goals that are set for a particular and specific reason (Bandura, 1997). Such goals are termed “target goals” (Harackiewicz and Sansone, 1991). For example, a student may set a target goal to obtain a grade of nine out of ten on a specific exam (Pintrich, 2000a). Target goals have clear criteria that allow individuals to define precisely whether they attained their goals or not. However, this goal does not provide the researcher with the reason *why* individuals would like to pursue these goals (Pintrich, 2000a).

Conversely, “general goals” encompass target goals, as well as the reason why an individual is motivated to attain these goals (Ford, 1992). These types of goals (which include but are not limited to goals to obtain joy, security and inspiration) are very broad goals that apply to all aspects of life (Ford, 1992). However, with general goals, the criteria that individuals adopt to define whether they achieved their goals are not as precise as for target goals (Pintrich et al., 2003).

The third type of goals, which lies intellectually between task goals and general goals, is termed “achievement goals” (Pintrich, 2000a). These goals are broader than task goals in that they not only identify “what” an individual is striving to achieve but also “why” they are striving to achieve their goal (Urdan, 1997). In addition, achievement goals differ from general goals in that they are more precise than general goals, which encompass broader “life” goals such as the attainment of pleasure, creativity, and relationships—goals that are difficult to define precisely (Pintrich et al., 2003).

According to Elliot and Fryer (2008), the above three types of goals share five basic features: each is (1) focused on an aim; (2) used to direct or lead behavior; (3) focused on the future; (4) internally represented (cognitively or otherwise); and (5) something to which the individual is dedicated to approach or avoid.

2.3 History of achievement goals

For more than three decades, achievement goals have received substantial consideration in the field of education (Conley, 2012; Kaplan and Maehr, 2007; Meece et al., 2006; Senko et al., 2011). Therefore, it is worthwhile presenting a history of achievement-goal theory.

Between the mid and late 1970s, four scholars at the University of Illinois (Carol Ames, John Nicholls, Carol Dweck and Marty Maehr) independently conducted a research program that aimed to understand students' achievement motivation (Elliot and Dweck, 2005; Senko et al., 2011). At the end of 1977, these researchers began meeting in a seminar series to discuss their concerns regarding their research (Roberts, 2012). These meetings influenced their thinking about achievement goals (Brandmo, 2013), as evidenced in articles some of these researchers wrote in that period (Maehr and Nicholls, 1980; Nicholls and Dweck, 1979) that articulated the basic ideas of achievement goals (Murayama et al., 2012). In the following years, Nicholls and Dweck continued working in this area, yet with different conceptualizations from each other (Elliot, 2005).

2.3.1 Dweck's conceptualization

Dweck articulated her ideas about achievement goals after studying late grade-school-age children (Elliot, 2005). In a series of publications (Diener and Dweck, 1978; Diener and Dweck, 1980; Dweck, 1975; Dweck and Reppucci, 1973), Dweck and colleagues revealed that students with relatively equal ability had different responses to task failure. These authors noticed that some students responded positively to failure by increasing their efforts and enhancing their performance, while others responded in a "helpless" manner characterized by diminution in performance and persistence. In an attempt to identify the root causes of this phenomenon, Dweck posited that the reason for such responses is connected to the "goals" that students adopt for finishing the task (Dweck, 1986a; Dweck and Leggett, 1988; Dweck, 1999). According to the authors, students who adopt "learning goals" view a given task as an opportunity to learn, gain knowledge and strengthen their competence. In addition, students who adopt these goals view failure as a beneficial experience that will help them in their future tasks. In contrast, students who adopt "performance goals" view a given task not as an opportunity to learn and gain knowledge but as an opportunity to demonstrate their competence (Elliott and Dweck, 1988; Smiley and Dweck, 1994). When failure at a task is encountered, such students view failure as an indication that they do not have the ability to succeed again in the task, even if they try harder. Thus, they reduce the amount of effort they usually apply to this task (Murayama et al., 2012).

It is noteworthy to say that students who adopt each type of goal (i.e. learning or performance goals) have different beliefs about ability. Learning-goal adopters view ability as malleable and able to be enhanced by greater effort, while students who adopt performance goals believe that ability is a stable trait that cannot be changed (Bempechat et al., 1991;Dweck and Leggett, 1988).

2.3.2 Nicholls' conceptualization

Nicholls' articulation of achievement goals emerged from research investigating the manner in which children conceptualize ability (Thrash and Hurst, 2008). Nicholls argues that children aged between five and eleven years old do not differentiate between ability and effort (Jagacinski and Nicholls, 1984; Jagacinski and Nicholls, 1987; Nicholls, 1976; Nicholls, 1978; Nicholls, 1980). At this early age, success is intertwined with effort, and children who can apply more effort are viewed as having greater ability (Elliot, 2005). At approximately age 12, children begin to distinguish between ability and effort. By this age, ability is "inferred" when a student outperforms their peers while applying equal effort, or when the student gains the same grades as others while applying less effort (Murayama et al., 2012).

According to Nicholls (1984), older students can view achievement situations as ability that is either intertwined with effort or separate from it. According to Nicholls (1984), such different views of ability form two broad types of achievement goals that students might pursue; "task-involvement" and "ego-involvement" goals. Students who pursue the task-involvement goal do not differentiate between ability and effort, and consider both as one, thus they try to learn by applying as much effort as possible (Nicholls, 1984). In contrast, students who pursue the ego-involvement goal do distinguish between ability and effort, thus they try to demonstrate their ability by outperforming their peers while applying only the minimum effort (Nicholls, 1984).

It is noteworthy that adopting of either ego or task involvement goals can lead to different outcomes (Elliot, 2005; Murayama et al., 2012). Students who adopt ego-involvement goals can gain positive effects when accompanied by a high perceived ability and negative effects when accompanied by a low perceived ability, while task-involvement is believed to lead to positive effects regardless of the level of perceived ability (Elliot, 2005).

Despite the differences between Dweck and Nicholls in articulating achievement goals, many “striking” similarities can be noted and considered (Elliot, 2005; Murayama et al., 2012; Thrash and Hurst, 2008). According to the authors, both Dweck and Nicholls stressed the importance of competence in the achievement-goal construct. In addition, both Dweck and Nicholls offered a dichotomy in conceptualization of achievement goals (i.e. Dweck’s learning goals and performance goals and Nicholls’ task-involvement students and ego-involvement students). Moreover, the goal types proposed by Dweck and Nicholls are comparable. For example, students who represent Dweck’s learning goals and Nicholls’ task-involvement students are characterized by applying a great deal of effort and seeking deep understanding of the task at hand, while students who represent Dweck’s performance goals and Nicholls’ ego-involvement students are characterized by their attempts to outperform others and demonstrate ability.

These conceptual similarities encouraged Ames and Archer (1987; 1988) to integrate the views of both Dweck and Nicholls into one achievement-goal approach. These authors argue that the conceptual work of Dweck and Nicholls was sufficiently similar to unify achievement-goal terms as a dichotomy comprising “mastery goals” and “performance goals.” According to Murayama et al. (2012), this unification was a breakthrough in uniting the terminology used in this research area and as a result, research on achievement goals blossomed thereafter, particularly in the field of higher education and sport (Elliot, 2005).

2.4 Types of achievement goals

Mastery goals and performance goals constituted the first dichotomous model of achievement goals upon which theorists generally agreed. In this model, mastery goals are concerned with acquiring and mastering the task at hand, whereas performance goals are concerned with outperforming others or appearing talented to others (Elliot, 2005).

There are two distinctions between individuals who adopt mastery goals and performance goals. First, adopters of the two different types of achievement goals view ability in different manners. Individuals who adopt mastery goals tend to view ability as an attribute that can be enhanced through practice and learning (Dweck, 1986). Thus, such individuals will enjoy challenging tasks and will be persistent and productive in task performance (Senko et al., 2011). However, individuals who adopt performance goals tend to view ability as a fixed attribute that cannot be enhanced or changed (Dweck, 1986). Thus, individuals who believe they have high ability will enjoy challenges, competition and appearing talented to others yet, those who believe they do not have high ability will avoid such activities (Hulleman and Senko, 2010; Senko et al., 2011).

The second distinction is concerned with the manner in which individuals adopting either type of achievement goal delineate success versus failure (Senko et al., 2011). Performance-goal adopters delineate success as the capability to outperform others or to appear talented, while mastery-goal adopters delineate success using self-referential criteria (for example, the individual feels that their skill or knowledge is being improved) (Hulleman and Senko, 2010; Senko et al., 2011). In this dichotomous model, researchers assume that individuals who adopt a mastery goal tend to understand the task at hand deeply, seek help when needed, use deep-learning strategies such as connecting concepts to their experience, have high self-efficacy and hold more positive attitudes toward tasks at hand and learning in general (Bouffard et al., 1995; Butler and Neuman, 1995; Kaplan and Midgley, 1997; Middleton and Midgley, 1997; Miller et al., 1996; Newman, 1998; Nolen, 1988; Pintrich and De Groot, 1990; Pintrich and Garcia, 1991; Wolters, 1998). However, such clear and consistently positive outcomes seen in mastery-goal adoption were not clear in performance-goal adoption (Hulleman et al., 2010; Senko et al., 2011). Adoption of performance goals has been demonstrated to lead to negative consequences such as anxiety, the use of surface-learning strategies, low academic achievement, self-handicapping and cheating (Elliot et al., 1999; Hulleman and Senko, 2010; Murayama and Elliot, 2012; Putwain and Symes, 2012). However, some researchers have found either zero or negative correlations with performance-goal adoption and the negative outcomes described above (Elliot, 2005; Murayama et al., 2012).

2.4.1 Trichotomous model of achievement goals

To resolve the lack of clarity surrounding performance-goal outcomes, Elliot and colleagues (Elliot and Church, 1997; Elliot and Harackiewicz, 1996) incorporated the approach–avoidance distinction into achievement-goal theory. This distinction centres on whether an individual’s aim is to approach a positive outcome (e.g. success) or to avoid a negative outcome (e.g. failure) (Elliot and Covington, 2001; Elliot and Harackiewicz, 1996; Thrash and Hurst, 2008). By introducing the approach–avoidance distinction, Elliot and Harackiewicz (1996) separated the performance goals into “performance approach” and “performance avoidance.” Thus, three distinct achievement goals were created: mastery goal, performance-approach goal and performance-avoidance goal. The main aim for an individual who adopts a performance-approach goal is to outperform their peers (Elliot and McGregor, 2001; Murayama et al., 2011; Senko and Harackiewicz, 2002) or to appear talented to others (Grant and Dweck, 2003; Kaplan and Maehr, 2007; Midgley et al., 2000). In the pharmacy education setting, for example, the main aim of pharmacy students with a strong performance-goal orientation would be either to attain higher marks in exams compared to their peers or to appear talented in front of their teachers and other students. In contrast, the main aim of an individual who adopts a performance-avoidance goal is to avoid doing worse than their peers or appearing less talented to others (Elliot, 1999; Elliot and McGregor, 2001; Urdan and Mestas, 2006). For example, we might see a pharmacy student who aims to avoid asking questions during lecture and tutorial times in order not to be criticized by his/her teachers and other students. In this model (i.e. the trichotomous model), only the mastery-goal construct has not been changed from the dichotomous model.

Elliot and Moller (2003), Hulleman and Senko (2010) and Senko et al. (2011) believe that many of the negative effects initially attributed to performance goals such as anxiety and cheating are exclusively associated with performance-avoidance goals. These authors argue that the introduction of the approach–avoidance construct to achievement-goal theory helped elucidate early inconsistencies in findings on performance goals.

2.4.2 2x2 achievement-goal model

Pintrich (2000b) and Linnenbrink and Pintrich (2000) argue that theoretically, the approach-avoidance distinction can also be applied to mastery goals. Based on their writings, Elliot and McGregor (2001) extended the trichotomous model by bifurcating mastery goals into “mastery-approach goals” and “mastery-avoidance goals.” Thus, achievement goals came to consist of four types of goals: performance-approach, performance-avoidance, mastery-approach and mastery-avoidance goals. The mastery-approach goal has been conceptualized as a sub-type of mastery goals that leads to the most positive outcomes (i.e. the same view that was held for mastery goals in the previous models of achievement goals) (Elliot, 1999; Elliot and McGregor, 2001). However, the most interesting feature of the 2x2 achievement-goal model is the inclusion of the mastery-avoidance construct that denotes a focus on avoiding not mastering a task or activity as thoroughly as possible, failing to learn or develop skills, losing skills that had previously acquired, or being unable to live up to one's standards (Elliot and McGregor, 2001; Hulleman et al., 2010).

Although Sideridis and Mouratidis (2008) argue that the prevalence of the mastery-avoidance goal is low in the education sector compared to other types of achievement goals, this goal is thought to be common in fields such as physical sports and work settings (Van Yperen et al., 2009). In addition to these two fields, Elliot and Thrash (2001) argue that mastery-avoidance goals can be quite common in elderly individuals who do not want to lose their previously acquired skills or knowledge as a result of aging. In addition, the authors argue that university students who have a high degree of "perfectionism" have a high chance of adopting mastery-avoidance goals so as to "make sure [they] don't make any mistakes." (Elliot and Thrash, 2001, p. 146). It can be argued that the mastery-avoidance goal might be adopted by pharmacy students who possess perfectionist traits or are concerned with making sure they retain all their knowledge acquired over the course of their degree.

2.5 Achievement goals and education

Research on achievement goals began as an attempt to study students' motivations. Thus, it is not surprising to find that a great majority of research conducted in this area has been conducted on students in education settings and in particular, in higher education settings (Hulleman et al., 2010).

The findings for mastery-approach goals have been consistent and positive. Students who adopt this type of goal are found to be interested in their subjects, enjoy learning, have low procrastination compared to others, have high self-regulation and efficacy, have long-term retention of course materials and seek help when needed (Bong, 2001; Elliot and McGregor, 1999; Harackiewicz et al., 2002a; Linnenbrink, 2005; Pajares and Valiante, 2001; Pekrun et al., 2006; Wolters, 2004). However, despite these positive effects, research demonstrates no consistently positive significant relationship between the adoption of mastery-approach goals and academic achievement (Hulleman et al., 2010). This is in contrast to what early theorists such Dweck (1986b) and Nicholls (1984) believed regarding the benefits of the mastery-approach goal. They believed that students who pursue this type of achievement goal would attain high marks as well, however empirical research has proved otherwise (Senko et al., 2011).

As the mastery-avoidance goal is a relatively new addition to achievement-goal constructs, few data are available for this type of goal. However, from the data available, mastery-avoidance goals are associated with negative outcomes such anxiety, avoidance of seeking help when needed, low academic performance and low intrinsic motivation (Cury et al., 2006; Karabenick, 2003; Sideridis, 2008; Van Yperen et al., 2009).

Performance-approach goals have been connected to several different outcomes. This type of achievement goal is associated with persistence, high mental concentration and high academic achievement (Cury et al., 2006; Elliot et al., 1999; Harackiewicz et al., 2002b; Lee et al., 2003). However, performance-approach goals have also been connected to using memorization to learn, anxiety, and either no significant positive correlation with academic achievement or a significant negative correlation with academic achievement (Elliot et al., 1999; McGregor and Elliot, 2002; Payne et al., 2007; Utman, 1997). The reason for such divergent results is the different conceptualization of the performance-approach goal, which is explained further in section 2.7.

Research findings regarding performance-avoidance goals have been consistent, yet negative. Students who adopt the performance-avoidance goal tend to use memorization as a learning strategy, have high anxiety and depression compared to other students, cheat in exams, do not seek help when needed, procrastinate, and have low academic achievement (Baranik et al., 2010; Elliot et al., 1999; Middleton and Midgley, 1997; Murayama and Elliot, 2012; Putwain and Symes, 2012; Sideridis, 2005; Smith, 2003; Smith and Sinclair, 2005; Urdan, 2004a).

One can argue that different cultures and ethnicities are present in many Western cultures. For example, 26% of the Australian population was born overseas (Australian Bureau of Statistics, 2012). Although such diversity is well represented in higher education, few studies have been conducted to investigate the relationship between ethnicity and achievement goals (Witkow and Fuligni, 2007). One of these studies was conducted by Elliot and his colleagues (2001) who found that the performance-avoidance goal is more strongly adopted by Asian-American than their Anglo-American peers. The authors believed that such a finding was a result of the differences between the two cultures. According to the authors, Asian-American students come from a background that values avoiding negative outcomes and consequences, while the Anglo culture value positive outcomes (Elliot et al., 2001). Another study was conducted by Zusho and his colleagues (2005) who found similar results when they studied the relationship between ethnicity and students' achievement goals. However, the authors found that Asian-American students obtained high academic achievement in mathematics compared to their Anglo-American peers (Zusho et al., 2005).

Although these studies shed some light on the relationships between ethnicity and achievement goals, nothing is known regarding undergraduate pharmacy students. In addition, these studies grouped all Asian ethnicities under one umbrella and did not differentiate between sub-Asian ethnicities such as Chinese, Korean, and Vietnamese. Such differentiation would give a clearer picture regarding the relationship between ethnicity and achievement goals.

Pintrich et al. (2003) argue that although a great deal of research has emphasized students' perceptions of different types of achievement goals, little research has illuminated the role of teachers in influencing students' goals. A study conducted by Patrick et.al (2001) to assess the effect of teachers in shaping students' goals revealed that students who strongly pursue mastery-approach goals had teachers that spoke about learning as an active process, and expressed strongly the positive effects of learning and the positive expectations students could have from learning. Conversely, teachers who spoke about grades and assessments created highly performance-oriented students. In addition to the teachers' influence on students, Pintrich et.al (2003) argue that other factors contribute to increasing or decreasing both mastery goals and performance goals such as prior school experience.

A recent study conducted by Shim et al (2013) revealed that teachers who adopt a mastery-approach goal can foster the adoption of this goal by their students, while teachers who adopt a performance-approach goal foster the adoption of the same goal by their students.

2.6 Multiple-goals perspective

It is simplistic to assume that students adopt one type of achievement goal through all situations and academic years. Rather than adopting a single type of achievement goal, it is argued that students can adopt multiple goal pathways (Smith and Sinclair, 2005).

As mastery-approach goals have been connected to many positive outcomes, with the exception of academic achievement, and performance-approach goals have been associated with a significant positive correlation with high academic achievement, Barron and Harackiewicz (2001) proposed a multiple-goal perspective that could lead to the academic benefits of both types of achievement goals. Barron and Harackiewicz (2001) proposed four hypotheses suggesting how multiple goals might promote optimal motivation. These four hypotheses are the following: additive-goal effects, specialized-goal patterns, interactive-goal effects, and selective-goal effects (Barron and Harackiewicz, 2001).

For the hypothesis of additive-goal effects, Barron and Harackiewicz (2001) proposed that using mastery-approach and performance-approach goals could have separate positive principal effects on a specific outcome. In the specialized-goal-patterns hypothesis, the authors argue that both mastery-approach and performance-approach goals have different outcomes for the student. For example, mastery-approach goals will increase students' interest, while performance-approach goals will increase students' grades. According to the selective-goal-effects hypothesis, using selective goals will enable students to switch between mastery-approach and performance-approach goals based on the situation. For example, when a student faces a novel task, they can use a mastery-approach goal, while if they face a situation in which outperforming others is preferred, they can switch to the performance-approach goal. In the interactive-goal-effects hypothesis, the authors assume that both mastery-approach and performance-approach goals can interact with each other, leading to enhancing motivation, cognition and achievement if the student scores high in both goals.

Smith and her colleague (2005) in their empirical study, found evidence for multiple goals benefits. The authors found that students who adopt both mastery-approach and performance-approach goals reaped the benefits of both types of goals such deep learning, high academic achievement and low test anxiety. According to Smith and Sinclair (2005), these benefits could not have been achieved if the students use mastery-approach or performance-approach goals separately.

Despite the benefits found by Smith and Sinclair (2005), the multiple goal perspective has generated a great deal of debate among achievement-goal theorists. For example, while Pintrich et al. (2003) welcome this addition to the theory, Brophy (2005) stands against it, arguing that research on performance-approach goals should be ceased and only research on mastery-approach goals should be advocated (Brophy, 2005). One of the main arguments for why researchers should stop investigating performance goals is that students rarely pursue them. To support his argument, Brophy (2005) reported three published qualitative research papers (Anderson et al., 1985; Lemos, 1996; Rohrkemper and Bershon, 1984) that were conducted to investigate elementary school students' achievement goals. In all of the three studies, performance goals were rarely mentioned which, led Brophy (2005) to conclude that performance goals are rarely pursued in real life and thus, scholars should stop studying them. This conclusion has been described by Senko et al., (2011) as a "premature" one. According to Senko et al (2011), Brophy (2005) only used three studies to support his conclusion while there are five other studies in which a considerable percentage of students pursued performance goals (Senko et al., 2011). However, a closer look at these five studies reveals that only two were conducted with elementary school students: Levy et al., (2004) who found that 34% of elementary students pursue performance goals and Urdan (2004b) who found that 25% of elementary and middle school students pursue performance goals. The other three studies were conducted with undergraduate university students in the US (Harackiewicz et al., 1997), Switzerland (Job et al., 2009) or Germany (Hijzen et al., 2007).

By comparing both sides of this argument, it is clear that Brophy (2005) made a bold statement by claiming that researchers should stop studying performance goals as students rarely pursue them. The above research indicates otherwise even when elementary school students were involved. In addition, reaching such a decision (i.e. ceasing the studying of performance-approach goals) based only upon findings among elementary students, is a hasty decision. Brophy (2005) ignored several studies that reported the benefits of this type of achievement goals, particularly for high school and undergraduate students (see for example, Elliot et al., 1999; Elliot and Moller, 2003; Harackiewicz et al., 1997; Harackiewicz et al., 1998; Harackiewicz et al., 2002a; Harackiewicz et al., 2002b; Hulleman et al., 2010; Murayama et al., 2012; Senko et al., 2011; Smith, 2003; Smith and Sinclair, 2005).

2.7 Different views about achievement-goal constructs

The concept of achievement goals is a complex one, and in order to give the reader a clear understanding about this concept, it is worth spending some time discussing the different views regarding the achievement goal constructs. Although achievement-goal theorists often assume that a precise view and definition of achievement goals has been established, a careful review of the literature reveals an ambiguous view about achievement-goal constructs (Elliot and Thrash, 2001; Kaplan and Maehr, 2007). Researchers who offered views for achievement-goal constructs have typically adopted one of the three approaches described below.

2.7.1 Viewing achievement goals as a purpose

Early researchers view achievement goals as the purpose for which individuals engage in achievement behaviour (Dweck, 1986; Maehr, 1989; Nicholls, 1989). In this approach, researchers aim to understand the purpose behind engaging in one activity and not another. However, the word “purpose” has several meanings in English. According to the Oxford English Dictionary (2014), “purpose” can be defined as “That which a person sets out to do or attain; an object in view; a determined intention or aim” or as “The reason for which something is done or made.” Thus, researchers who adopt this approach combine the two definitions of “purpose” in their conceptualization of achievement goals. For example, mastery-approach goals can be conceptualized in this approach as an aim to master the task at hand or as a reason to improve one’s skills (Pintrich, 2000b; Urdan and Maehr, 1995).

2.7.2 Viewing achievement goals as a collection of integrated variables

Researchers who view achievement goals as a collection of integrated variables conceptualize achievement goals as a collection of numerous achievement feelings and beliefs that are integrated with each other to build an achievement-goal construct (Ames, 1992; Ames and Archer, 1987; Kaplan and Maehr, 2007; Pintrich and and Schunk, 1996). According to these researchers, every type of achievement goal is influenced by these feelings and beliefs and vice versa.

2.7.3 Viewing achievement goals as a precise and specific aim

Elliot and Thrash (2001) argue that there are many limitations to the above two approaches. The authors criticize both approaches, as they comprise two definitions and several variables that mean it is difficult to discover the exact influential aspect of achievement goals upon individuals. For example, in these approaches, it is not possible to determine precisely why a student adopts a mastery-approach goal since there are several different possibilities, including that they might want to learn as much as possible, aim to succeed or because they have certain beliefs around this type of achievement goal.

Another criticism from Elliot and Thrash (2001) came as a question. The authors queried that if achievement goals are a collection of numerous integrated variables, how many of these variables should be present in a student prior to describing him/her as having this type of achievement goals or another? According to Elliot and Thrash (2001) unlimited traits and variables associated with achievement goals could make the differentiation between achievement goals hard to achieve. In an attempt to address the above limitations, Elliot and Thrash (2001, p. 144), created a new conceptualization of the achievement goal, viewing it as “a specific type of goal, one in which the focal end state or result is competence.” According to this definition, the authors conceptualize competence as an integral part of achievement goals.

According to Elliot and Dweck (2005), achievement goals can be separated into two basic dimensions according to the manner in which competence is defined and according to the manner in which competence is valenced.

Competence can be evaluated and therefore defined using three standards: the “absolute standard” (the standards of the task itself); the “intrapersonal standard” (the standards that the individual places on themselves); and the “normative standard” (the standards that exist when comparing with others). In this approach, Elliot and colleagues (Elliot and Dweck, 2005; Elliot and McGregor, 2001; Elliot and Thrash, 2001) argue that absolute and intrapersonal standards share many similarities that can allow them to be combined into one distinction “absolute/intrapersonal standard.” Thus, two distinctions appear; 1) the absolute/intrapersonal distinction and 2) the normative distinction. Both distinctions can be viewed as a definition of competence (Elliot and Thrash, 2001). The competence definition is believed to mirror the mastery–performance distinction applied to achievement goals, with mastery goals represented by the absolute standards and interpersonal standards, and performance goals represented by the normative standard (Elliot and McGregor, 200;1Elliot and Thrash, 2001).

Competence is valenced by either approaching positive competence (e.g. success) or avoiding negative competence (e.g. failure) (Murayama et al., 2012). By combining the two dimensions of competence (i.e. the definition and the valence), four types of achievement goals are produced: the absolute/intrapersonal-approach goal (i.e. the mastery-approach goal); the absolute/intrapersonal-avoidance goal (i.e. the mastery-avoidance goal), the normative-approach goal (i.e. the performance-approach goal); and the normative-avoidance goal (i.e. the performance-avoidance goal) (Figure 1).

		Definition	
		Absolute/Intrapersonal (Mastery)	Normative (Performance)
Valence	Positive (approaching success)	Mastery-approach goal	Performance-approach goal
	Negative (avoiding failure)	Mastery-avoidance goal	Performance-avoidance goal

Figure 1: The 2x2 achievement-goal model. Adapted from Elliot and McGregor (2001)

In summary, three approaches to defining the achievement-goal constructs have been described; 1) defining achievement goals as a purpose, 2) defining achievement goals as a collection of integrated variables and 3) defining achievement goals as a precise and specific aim.

It could be argued that the third approach is more appealing than the other approaches, as it clearly distinguishes achievement goals from any other processes, tendencies and consequences (Elliot and Thrash, 2001). In addition, this approach defines the achievement goal in a precise and clear manner that is essential to scientific research (Murayama et al., 2012).

2.8 Measuring achievement goals

As mentioned, researchers do not agree on one operational definition of achievement goals. This divergence has an effect on the measurement tools that are used to identify and measure achievement goals, as well as the results these instruments yield (Elliot and Murayama, 2008; Hulleman et al., 2010; Hulleman and Senko, 2010; Murayama et al., 2012; Senko et al., 2011). It is noteworthy to say that there were no disputes between the instruments' creators regarding the mastery-approach construct as there is a consensus about the conceptualization of this type of achievement goals. However, performance-approach goals, as mentioned earlier, have been conceptualized as either a goal to outperform others, for example, "It is important for me to do better than other students" (Elliot and McGregor, 2001, p.504) or as a goal to demonstrate ability to others, for example, "One of my goals is to show others that I'm good at my class work." (Midgley et al., 2000, p.12). This difference is important and leads to different conclusions (Donnellan, 2008). For example, researchers who adopt the former definition tend to find significant positive correlations between performance-approach goals and academic achievement (i.e. grades), whereas researchers who adopt the latter definition tend to find negative correlations between performance-approach goals and academic achievement (Hulleman et al., 2010). This finding highlights the importance of considering the measurement tools carefully before assessing the effects of performance-approach goals (Hulleman et al., 2010).

There are a number of instruments that were created in order to identify students' achievement goals, including the Mastery and Performance Scale (Archer, 1994), Task–Ego Orientation Scale (Duda and Nicholls, 1992), Kaplan et al (2002), and the Scale and Butler (1992) Scale. The two most commonly used instruments to measure achievement goals in education settings, however are the Patterns of Adaptive Learning Scales (PALS)

(Midgley et al., 2000) and the Achievement Goal Questionnaire (AGQ) (Elliot and McGregor, 2001) (Huang, 2011; Huang, 2012).

PALS reflects earlier models of achievement-goal theory where three types of goal orientations were conceptualized: performance approach (five items to measure it); performance avoidance (four items to measure it); and mastery approach (five items to measure it). The notion of mastery-avoidance was yet to be developed. PALS is a questionnaire that adopts demonstrating ability to others as a conceptual definition for performance-approach goals, for example, “One of my goals is to show others that class work is easy for me.” (Midgley et al., 2000, p.12).

The AGQ incorporates the mastery-avoidance goal (three items) in its model, along with all other types of achievement goals (three items each). In contrast to PALS, this instrument adopts the normative definition of the performance-approach goal (i.e. outperforming others). In addition to incorporating the mastery-avoidance goal into the AGQ, this questionnaire has been created and validated using undergraduate students and has mainly been used in higher education settings, in contrast to PALS, which has been used in all education settings, including elementary-school students, middle-school students, high-school students and undergraduate-university students (Hulleman et al., 2010). In an attempt to develop a more precise instrument that can identify students’ achievement goals, Elliot and Murayama (2008) created a revised version of the AGQ, the Achievement Goal Questionnaire – Revised (AGQ-R). The authors claim this instrument is superior to the AGQ in measuring achievement goals, as it excludes the goal-irrelevant words. For example, the item that states “It is important for me to do better than other students” in the AGQ was changed to “My goal is to perform better than the other students.” (Elliot and Murayama, 2008, P.617).

It is worth noting that there appear to be no instruments created specifically to measure undergraduate health, medical or pharmacy students’ achievement goals.

2.9 New directions for achievement goals

A great deal of research conducted in the field of achievement goals has focused on “what” is the nature of the connections between achievement goals and academic performance (Hulleman et al., 2010; Senko et al., 2011; Senko and Miles, 2008). However, investigating “why” these connections occur (i.e. why the mastery-approach goal does not predict academic achievement while the performance-approach goal does) has received little attention in the literature (Hulleman and Senko, 2010).

Two hypotheses have emerged that seek to explain the connections between goal types and academic achievement: (1) the Learning Agenda Hypothesis, and (2) the Social Desirability/Utility hypothesis.

2.9.1 The Learning Agenda Hypothesis

Regardless of students’ study strategies (i.e. deep or surface), knowing “what” to study has a significant effect on students’ academic achievement (Broekkamp and Van Hout-Wolters, 2007). Based on this, Senko and Miles (2008) proposed that the reason behind students, who strongly pursue mastery-approach goals, not attaining high grades in exams is because they follow their own “learning agenda” when studying (Senko and Miles, 2008). According to these authors students who adopt the mastery-approach goal define success in a relatively “easy” manner compared to students who adopt the performance-approach goal and who have strict criteria for defining success. In other words, students who pursue mastery-approach goals use self-referential standards when they define success (e.g. I feel that I understand the subject sufficiently), whereas students who pursue performance-approach goals use either topic or teacher criteria to define success (e.g. achieving nine correct answers out of ten). These self-referential standards adopted by mastery-approach-focused students in defining success mean that students feel less pressure during study compared to performance-approach-focused students, which in turn increases their interest in the subject (Senko and Harackiewicz, 2005). Senko and Miles (2008) posit that interest is the main cause that leads students to follow their own agenda and study the material that appears interesting to them, regardless of its testability.

Senko and Miles (2008) found some evidence for this hypothesis. In their study on 260 psychology students, they found that students who pursue mastery-approach goals allocated their study efforts excessively to material they found personally interesting, paying little attention to other topics they considered boring, and this in turn predicted low grades. Students who pursue performance-approach goals did not demonstrate this pattern because one of the characteristics of performance-approach students is to outperform their peers based on teacher-set criteria (Senko et al., 2011).

In addition to Senko and Miles (2008), Shell and Husman (2008) and Senko et al. (2013) found that performance-approach students tend to keenly seek out information about which material will be tested on exams and allocate time to study what is important to their teachers, thus obtaining high grades compared to mastery-focused students.

Finally, Senko and colleagues (2012) found that these two different learning agendas have an effect on students' preferences in their teachers. The authors found that mastery-oriented students prefer teachers who have wide experience so that they are able to answer their questions and interests, while performance-oriented students prefer teachers who give them advice on how to obtain high grades in exams (Senko et al., 2012).

2.9.2 Social desirability/utility hypothesis

Although the social desirability/utility hypothesis is not central to this thesis, for completeness, a brief overview will be provided.

Another attempt to explain why mastery-approach-focused students do not gain high grades compared to performance-approach-focused students comes from Dompnier et al. (2009), who posited that the relationship between the mastery-approach goal and academic achievement can be precisely determined by understanding the reason behind students adopting this type of achievement goal. According to the authors, students adopt mastery-approach goals either to please their teachers (social desirability) or to succeed in their studies (social utility). Dompnier et al. (2009) hypothesized that students who adopt mastery-approach goals out of social desirability might gain low grades compared to students who adopt the same type of goals to succeed in their studies. To test this hypothesis, the authors conducted a study with 265 first-year-university psychology students in France. They found that students who adopt mastery-approach goals to please their teachers (social desirability) tend to achieve low grades compared to students who adopt mastery-approach goals to master the task at hand and succeed in their studies (social utility) (Dompnier et al., 2009).

Although more than 1000 publications and dissertations have been inspired by achievement goal theory (Hulleman et al., 2010), only two of these appear to have been used in the pharmacy education setting. Waskiewicz (2012) used achievement goal theory as a framework to investigate students' motivations to achieve in a low stakes exam, compared to their motivations towards a PharmD program. The author found a direct link between the motivation to achieve in the exam and both performance-approach and mastery-approach goals. The second study was conducted by Gavaza and colleagues (2014). In their cross-sectional study, the authors found that second year PharmD. program students pursue work-avoidance goals more than first year students in the same program.

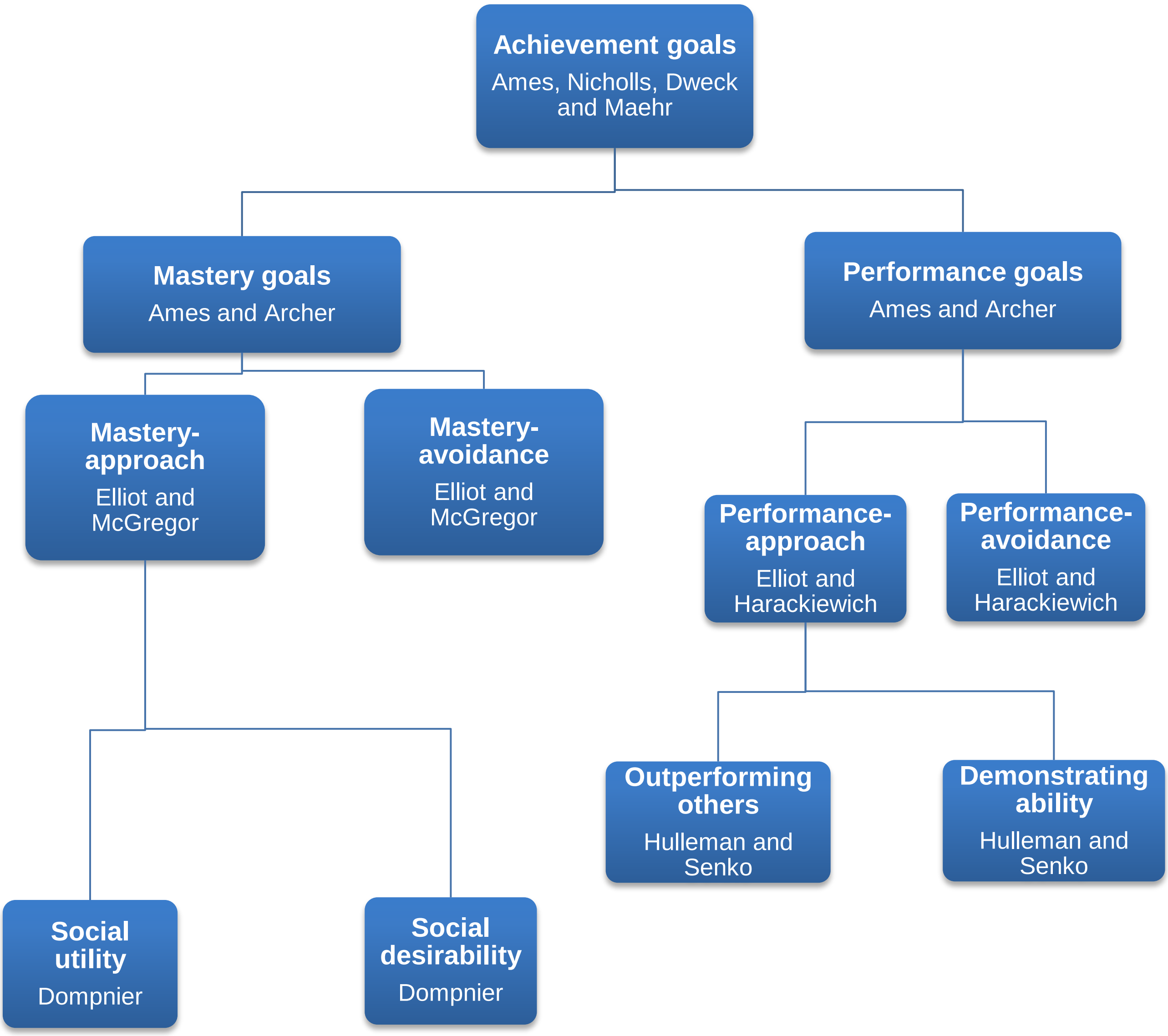
Although these two studies provide us with a good starting point for understanding pharmacy students' achievement goals, this area of pharmacy education needs many more studies before robust conclusions can be drawn regarding pharmacy students' achievement goals. In addition, both studies had been conducted in the USA using students who already have either a bachelor level degree in a related area or possessed some higher education subjects. There is no evidence of any achievement motivation research involving undergraduate pharmacy students either in Australia or anywhere else.

In summary, researchers of achievement goals generally agree upon four types of achievement goals: performance approach (i.e. the individual's goal is to outperform others or demonstrate their ability); performance avoidance (i.e. the individual's goal is to avoid doing worse than others); mastery approach (i.e. the individual's goal is to deeply understand the topic at hand); and mastery avoidance (the individual's goal is not to lose their previously acquired skills) (Dicke et al., 2012; Elliot and McGregor, 2001; Elliot and Murayama, 2008; Gherasim et al., 2013; Hart et al., 2013; Hulleman et al., 2010; Senko et al., 2011). Although there is a consistency in the findings regarding mastery-approach, mastery-avoidance and performance-avoidance goals, this is not apparent in the case of performance-approach goals. This is primarily due to different conceptualizations of this goal. Scholars who conceptualize performance-approach goals as a demonstration of ability tend to use the PALS instrument and have found no correlation between this type of goal and academic achievement, whereas researchers who conceptualize this goal as an aim to outperform one's peers, tend to use the AGQ or AGQ-R and have found a significant positive correlation between this type of achievement goal and academic achievement. In addition, the AGQ is the first instrument that has incorporated the mastery-avoidance construct in it and was created for use with undergraduate students.

The new directions for achievement goals that are intended to answer “why” mastery-approach goals do not predict academic achievement include The Learning Agenda and Social desirability/utility hypotheses.

Finally, although more than 1000 dissertations and articles have been published regarding achievement goal theory, only two have focused on pharmacy students. Figure 2 summarizes the types of achievement goals that have been conceptualized by researchers to date.

Figure 2: Types of achievement goals and their most influential proponents.



Chapter 3: Project Overview

3.1 Introduction

This chapter provides an overview of the program of research undertaken for this doctorate. The thesis comprises ten chapters. Chapters 1 and 2 of this thesis have provided the conceptual and historical background which underpins the research. Chapter 4 details the exploratory study undertaken into first-year undergraduate pharmacy students' and academics' views of and preferences for learning and teaching in the Faculty of Pharmacy at the University of Sydney, Australia. Chapter 5 details the validation of and selection between two instruments designed to measure students' achievement goals. Chapter 6 identifies students' achievement goals and their relation to ethnicity and academic achievement. Chapter 7 investigates the extent to which undergraduate pharmacy students' achievement goals change over time. Chapter 8 reports the results of an international comparison of students' achievement goals and their relation to assessment types and academic achievement, conducted between undergraduate pharmacy students from multiple English-speaking countries. Chapter 9 investigates the relationship between pharmacy students' achievement goals and their preferred teacher qualities. Chapter 10 discusses the findings of the studies conducted, makes concluding remarks and provides some direction for future research.

3.2 Aims and objectives

The primary aim of this doctoral research was to investigate undergraduate pharmacy students' achievement goals and their relation to academic achievement in both local and international settings. A secondary aim of this project was to identify the relationships between students' achievement goals and the qualities they would like to see in their teachers. To underpin the program of research, two extensive reviews of the literature were conducted. These comprised 1) the existing literature surrounding pharmacy education and its development through the centuries in Europe, the United States and Australia, and 2) the achievement goals literature, with a focus on the relations with academic achievement, specifically in undergraduate settings.

The project objectives and their related methodologies are detailed below:

1. **Investigate undergraduate pharmacy students' preferences regarding their pharmacy teaching and learning environment.**
2. **Investigate pharmacy teaching academics' views regarding their undergraduate pharmacy students' learning attributes, and their preferred methods of teaching and assessment.**

These two objectives were necessary to understand and appreciate the learning and teaching environment in the Faculty of Pharmacy at The University of Sydney, and act as a basis to investigate the students' achievement goals and their relations to academic achievement.

Qualitative interviews were carried out using in-depth semi-structured focus group interviews with a sample of first-year undergraduate pharmacy students from the BPharm program at the Faculty of Pharmacy, the University of Sydney. Individual interviews were also conducted with a sample of academics who were teachers in the first year. The focus group interviews aimed to explore the students' preferences regarding their pharmacy teaching and learning environment. The individual interviews were carried out to investigate teachers' views regarding their first-year undergraduate students' learning attributes as well as the teaching methods they would like to apply. These interviews provided the preliminary insights into the teaching and learning environment in the Faculty of Pharmacy at the University of Sydney.

The results of objectives #1 and #2 are reported in Chapter 4, as a published original research article: Alrakaf, S., Sainsbury, E. & Smith, L. (2014) First year undergraduate pharmacy students' and academics' views of and preferences for learning and teaching. A preliminary investigation. *Research Journal of Pharmacy and Technology*, 7, 161-167.

3. **Assess the construct validity of the Achievement Goal Questionnaire and the Revised Achievement Goal Questionnaire (Elliot and McGregor, 2001; Elliot and Murayama, 2008) using a cohort of Australian undergraduate pharmacy students.**
4. **Test the generalizability and replicability of these tools in schools of pharmacy in other English-speaking countries.**

This part of the thesis involved the validation of and selection between two questionnaire instruments for measuring achievement goals, both of which were specifically designed to measure the achievement goals of undergraduate students. The aim was to select the most psychometrically sound model for use as a tool in investigating pharmacy students' achievement goals. Two questionnaires were administered to a sufficient sample of undergraduate pharmacy students from Australia and other English-speaking countries to identify which questionnaire was the most valid. A confirmatory factor analysis technique was used to validate both questionnaires.

The results of objectives #3 and #4 are reported in Chapter 5, as a published original research article: Alrakaf, S., Sainsbury, E., Rose, G. & Smith, L. (In Press-a) An International Validation Study of two Achievement Goal Measures in a Pharmacy Education Context *Advances in Medical Education and Practice*.

5. **Investigate Australian undergraduate pharmacy students' achievement goals and their relation to their academic achievement in the first and third years.**
6. **Compare the achievement goal orientations between first-year and third-year undergraduate pharmacy students.**
7. **Examine the influence of different ethnicities on achievement goals.**

The findings from the validation study (Chapter 5) enabled the researcher to explore the different types of achievement goals that undergraduate pharmacy students adopted during their studies. In addition, the previous stage's results were used to identify the relationship between pharmacy students' achievement goals and their academic achievement as well as the influence of different ethnicities on achievement goals.

The results of objectives #5, #6 and #7 are reported in Chapter 6, as a published original research article: Alrakaf, S., Sainsbury, E., Rose, G. & Smith, L. (In Press-b) Identifying Achievement Goals and their Relation to Both Academic Achievement and Ethnicity in Undergraduate Pharmacy Students: A Comparative Cross-Sectional Study. *American Journal of Pharmceutical Education*.

8. **Assessing Students' Achievement Goals Over Time.**

This stage comprised a follow up of two undergraduate pharmacy student cohorts to explore the extent to which their achievement goals change over time. Two cohorts were followed up for one academic year. Cohort One (students from year 1 to year 2) and cohort Two (students from year 3 to year four). The validated questionnaire was used for both cohorts at both times. The result of objective #8 is reported in Chapter 7, as a short report.

9. **Identify the predominant type of achievement goals in multi-national undergraduate pharmacy student settings.**
10. **Compare the achievement goals of these samples with each other.**
11. **Identify the relationships between achievement goals and different types of academic assessments.**

This stage involved a collaboration with universities from four English-speaking countries to explore and compare undergraduate pharmacy students' achievement goals and their relation to assessment types and academic achievement using the validated questionnaire.

The results of objectives #9, #10 and #11 are reported in Chapter 8 as an original research article currently under review: Alrakaf, S., Anderson, C., Coulman, S., John, D., Tordoff, J., Sainsbury, E., Rose, G. & Smith, L. (Revision Submitted) An International Comparison Study of Pharmacy Students' Achievement Goals and their Relationship to Assessment Type and Marks. *American Journal of Pharmceutical Education*.

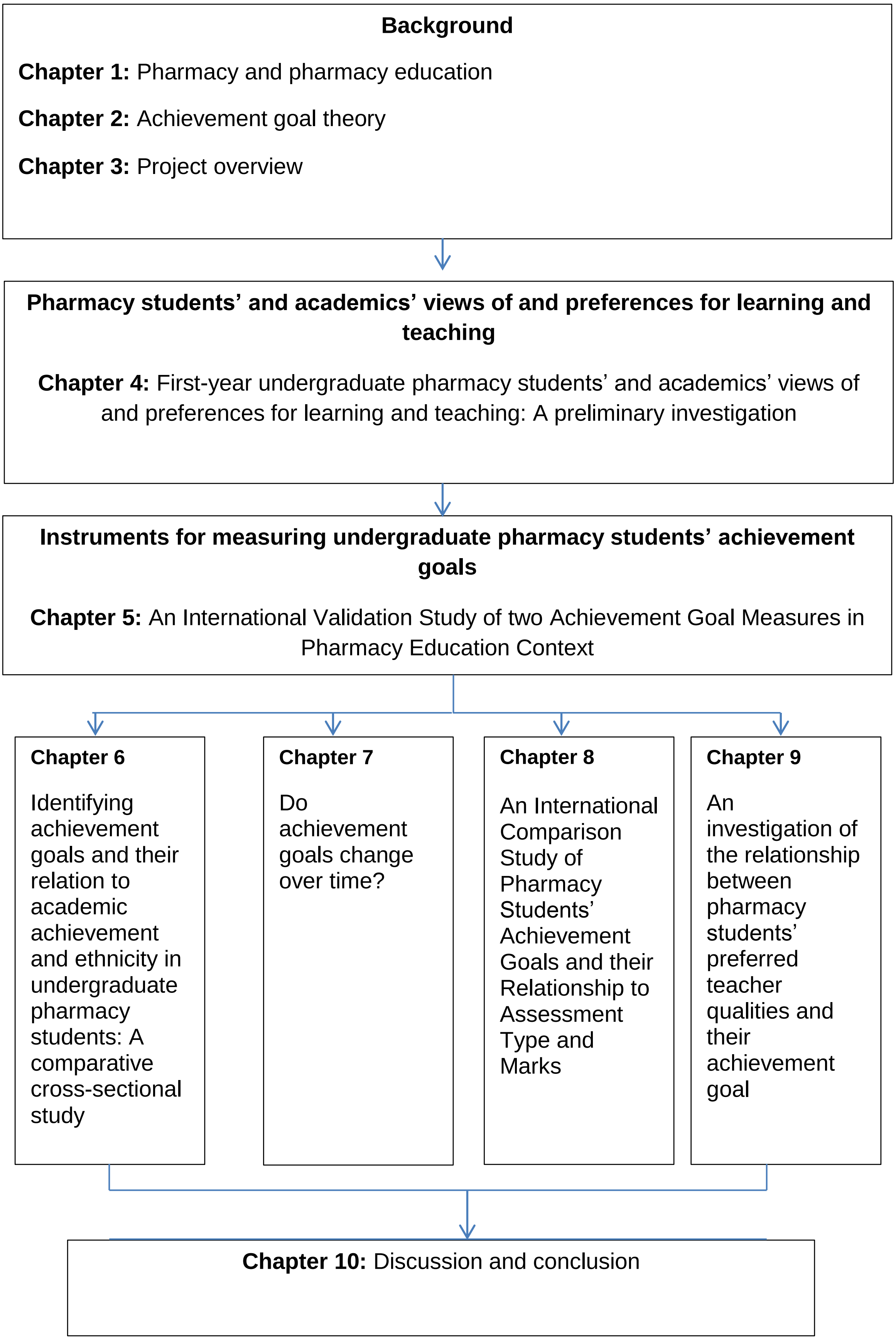
12. **Investigate the qualities that pharmacy students prefer the most in their teachers.**
13. **Test, in a pharmacy education setting, assumptions regarding how mastery-approach and performance-approach goals affect students' preferences about teachers' qualities.**
14. **Investigate the effects of the avoidance type of achievement goals (i.e. mastery-avoidance and performance-avoidance) on teacher qualities.**

This involved exploring undergraduate pharmacy students' preferred teacher qualities that they would like to see in their teachers and how adopting certain types of achievement goals might affect such preferences. In this study, undergraduate pharmacy students completed the validated achievement goal questionnaire and a build-a-teacher task. For the latter, participants were given a $ 20 hypothetical budget to purchase amounts of nine widely valued teachers' qualities.

The results of objectives #12, #13 and #14 are reported in Chapter 9 as a published original research article: Alrakaf, S., Sainsbury, E., Rose, G. & Smith, L. (In Press-b) An Investigation of the relationship between pharmacy students' preferred teacher qualities and their achievement goal orientations. *American Journal of Pharmaceutical Education*.

The overall structure of this thesis is summarized in Figure 1.

Figure 1: Thesis structure



Chapter 4: First-year undergraduate pharmacy students' and academics' views of and preferences for learning and teaching: A preliminary investigation

Alrakaf, S., Sainsbury, E. & Smith, L. (2014) First year undergraduate pharmacy students' and academics' views of and preferences for learning and teaching. A preliminary investigation. *Research Journal of Pharmacy and Technology*, 7, 161-167.

Authors' Contributions

Saleh Alrakaf conducted the study, performed the qualitative analysis, drafted and critically revised the manuscript. Lorraine Smith and Erica Sainsbury contributed to the data analysis.

Erica Sainsbury

Saleh Alrakaf

Erica Sainsbury

Lorraine Smith

Lorraine Smith

Ethics approval are in Appendix 2

Chapter 5: An International Validation Study of Two Achievement Goal Measures in Pharmacy Education Context

Alrakaf, S., Abdelmageed, A., Kiersma, M., Coulman, S., John, D., Tordoff, J., Anderson, C., Noreddin, A., Sainsbury, E., Rose, G. & Smith, L. (In Press-a) An International Validation Study of two Achievement Goal Measures in a Pharmacy Education Context, Advances in Medical Education and Practice.

Authors' contributions

Saleh Alrakaf conducted the study, performed the statistical analysis, drafted and critically revised the manuscript. Ahmed Abdelmageed, Mary Kiersma, Sion Coulman, Dai John, June Tordoff, Claire Anderson and Ayman Noreddin obtained ethics approvals from their institutions, administered the questionnaires and critically revised the manuscript. Erica Sainsbury, Grenville Rose and Lorraine Smith assisted with the statistical analysis and critically revised the manuscript.

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An International Validation Study of Two Achievement Goal Measures in a Pharmacy Education Context

Abstract

Background: Achievement goal theory helps us understand what motivates students to participate in educational activities. However, measuring achievement goals in a precise manner is problematic. Elliot and McGregor's (2001) achievement goal questionnaire (AGQ) and Elliot and Murayama (2008)'s revised achievement goal questionnaire (AGQ-R) are widely used to assess students' achievement goals. Both instruments were developed and validated using undergraduate psychology students in the USA.

Methods: In this study our aims were to first of all to, assess the construct validity of both questionnaires using a cohort of Australian pharmacy students and, subsequently, to test the generalizability and replicability of these tools more widely in Schools of Pharmacy in other English speaking countries. The (AGQ) and its revised version (AGQ-R) were administered during tutorial class time. Confirmatory factor analysis procedures, using AMOS 19 software, were performed to determine model fit.

Results: In contrast to the scale developers' findings, confirmatory factor analysis supported a superior model fit for the AGQ compared to the AGQ-R in all countries under study.

Conclusion: Validating measures of achievement goal motivation for use in pharmacy education is necessary and has implications for future research. Based on these results, the AGQ will be used to conduct future cross-

sectional and longitudinal analyses of the achievement goals of undergraduate pharmacy students from these countries.

Key words: achievement goals; confirmatory factor analysis; pharmacy education.

An International Validation Study of Two Achievement Goal Measures in a Pharmacy Education Context

Introduction

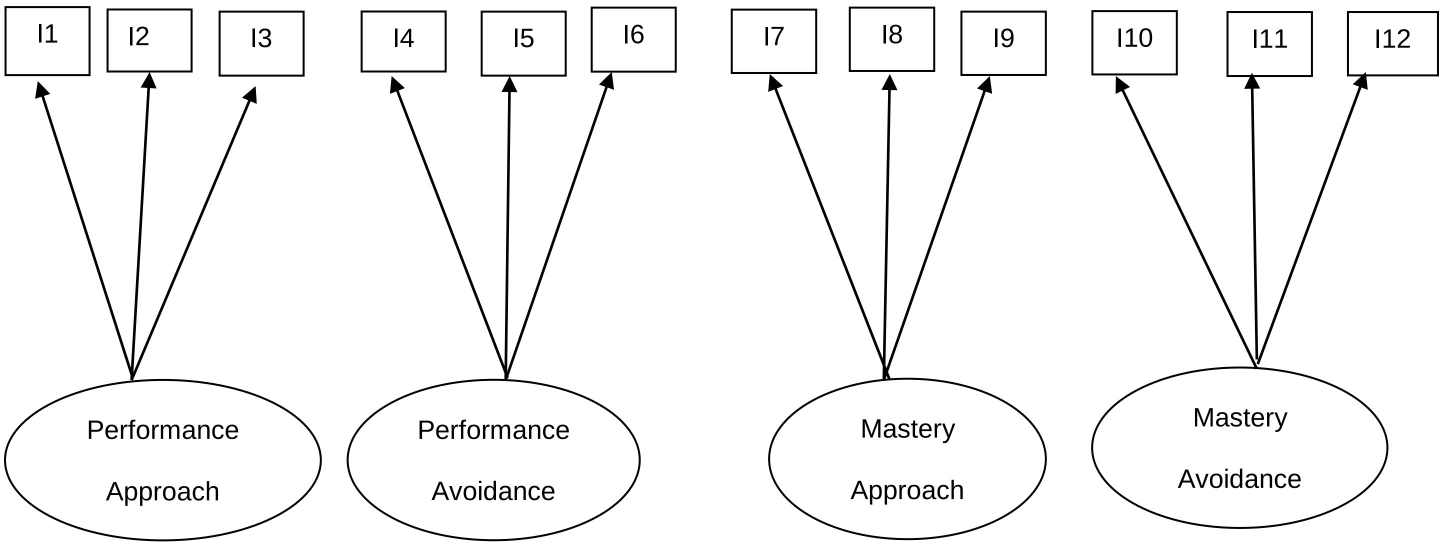
For more than three decades, achievement goal theory has been one of the most important motivational theories in the field of education and has undergone significant conceptual development during this time.[1-3] Achievement goals are precise types of goals that consider 'competence' as the aim for any individual.[4] Achievement goals are defined as a 'future-focused cognitive representation that guides behaviour to a competence-related end state that the individual is committed to either approach or avoid'.[5] Current understandings centre around four types of goals that are seen to influence students' achievement motivation in learning environments. These are: (1) Mastery-Approach (M-AP), where the individual is motivated to learn or improve his/her skills; (2) Mastery-Avoidance (M-AV), where the individual is motivated to avoid failure to learn or declines in skill; (3) Performance–Approach (P-AP), where the individual is motivated to outperform others or appear talented; and (4) Performance-Avoidance (P-AV), where the individual is motivated to avoid doing worse than others or appearing less talented.[6-10]

Many research have linked M-AP goal to a number of positive outcomes such as high interest,[11] high persistence,[12] using deep learning strategies,[13] and seeking help when needed.[14] However, despite these beneficial outcomes, no significant positive relationship between this type of achievement goals and academic achievement has been found.[5, 9] The P-AP goal, however, is associated with different effects. in one hand, it is linked to memorization instead of deep learning[15] and on the other hand, this type of achievement goals is linked with significant positive correlation to academic achievement.[9, 16-18] The avoidance types of achievement goals (i.e. M-AV and P-AV) are associated with negative outcomes such as low intrinsic motivation, anxiety and low academic achievement.[19-25]

Despite the positive contributions achievement goal theory has made to the field of education, achieving precision in measuring these achievement goals has been difficult[5, 26] and this is reflected in researchers' continued endeavours to examine the theoretical underpinnings of achievement goal motivation. For example, one well-known instrument is the Achievement Goals Questionnaire (AGQ)[6] (Elliot & McGregor, 2001).[8, 27] This instrument was developed and validated in higher education settings in the United States of America (USA) using a cohort of psychology students. More recently the AGQ underwent further refinement in an attempt to develop a more precise instrument. According to Elliot & Murayama (2008),[26] some items on the AGQ are assessing either a value (e.g. "It is important for me to do better than other students") or a concern (e.g. "I worry that I may not learn all that I possibly could in this class" instead of a goal. In addition, the authors argue that one of the items that was intended to measure the P-AV construct is measuring the goal with a reason behind this goal (e.g. My fear of performing poorly in this class is often what motivates me.). According to authors, this is not what the AGQ was meant to measure. It meant to measure the goal regardless of the reasons behind it (Elliot & Murayama, 2008). Furthermore, Elliot & Murayama (2008) argue that the word "grades" that appears in one item intended to measure the P-AP construct can be applicable for both mastery and performance goals. Based on these concerns, wording modifications occurred which resulted in the Revised Achievement Goal Questionnaire (AGQ-R)[26] (Elliot & Murayama, 2008), which was administered to undergraduate psychology students enrolled in USA universities. In both questionnaires (Figure 1), each achievement goal is measured by three variables (i.e. 12 variables for each questionnaire). Elliot and Murayama (2008)[26] used confirmatory factor analysis to compare the construct validity of the AGQ with the AGQ-R, and the latter was found to provide a better fit to the data and to be superior to the AGQ in predicting and determining achievement goals.[26]

Recently, Elliot and his colleagues[2] developed and tested a relatively new questionnaire that intended to measure six types of achievement goals; task-approach, task-avoidance, self-approach, self-avoidance, other-approach and other-avoidance.[2] These achievement goals have some similarities with the “classical achievement goals” for example task goals are to mirror the performance goals and self-goals are to mirror the mastery goals. Our study does not consider this questionnaire as it is a relatively new and has not been tested thoroughly.

Figure 1: Schematic model of relationship between construct and questionnaire items



I = Item

Comparative face validity review of the content of AGQ and AGQ-R suggests that some items in the revised questionnaire are confusing and hard to understand. However, face validity review can be influenced by subjectivity and is less empirical[28, 29] than an examination of the construct validity of the two instruments. This approach provides a more rigorous and defensible method of assessing the relationships between the questionnaire items and the achievement goal constructs they are purported to measure.[30-32] Furthermore, it is possible that in a different educational context and discipline area, such as a pharmacy education setting, these two measures may not be as precise in their measurement of university student achievement goal orientations. In addition, very little research has been conducted investigating the utility of scales for measuring achievement goals in different educational settings, including pharmacy education. The research that has been conducted in this field has related more to learning styles[33, 34] rather than achievement goals.

Validation of the AGQ and AGQ-R in an Australian pharmacy education setting is an important first step in determining the usability of these scales at a local level. However, since multinational data might influence the validity of these questionnaires,[35] participants from different countries will provide a more rigorous and generalizable investigation of the validity of the AGQ and AGQ-R measures. To our knowledge, there have been no cross-national validation studies of the motivational preferences of pharmacy students. Thus, results of this study will lay a foundation for future studies into undergraduate pharmacy students' achievement goals and will facilitate comparative and longitudinal research between different countries. Knowing pharmacy students' achievement goals will provide academics with invaluable understanding of how their students respond when they encounter academic activity.[23] Yet the first step is to determine a precise instrument to use for measuring these goals.

Therefore, the aims of this project were to first, assess the construct validity of the AGQ and AGQ-R using a cohort of Australian undergraduate Pharmacy students and, subsequently, to test the generalizability and replicability of these tools in Schools of Pharmacy in other English speaking countries. Ultimately, the most psychometrically appropriate version of the model can be determined.

Methods

Ethical approval was granted by human ethics committees in six participating universities.

Sample and Procedure

Study 1: Australian participants for this study were undergraduate students enrolled in the 4-year Bachelor of Pharmacy degree at the Faculty of Pharmacy, University of Sydney, Australia. The study was initiated during the first semester of 2012.

The researchers invited students to participate in the study during normal lecture or tutorial periods. They were advised that participation was voluntary and, if they chose to participate, they could withdraw from the project at any time. In addition, students were advised that their decision to participate would not impact on their academic results or influence their student-teacher relationships. Researchers approached the students as a group and not individually. The questionnaires were administered to students in paper form by the researchers. Completion of the questionnaires took approximately 15 minutes.

Study 2: International participants were students enrolled in a professional pharmacy degree program at universities in the USA (two universities), United Kingdom (UK) (two universities) and New Zealand. The locations for data collection were selected by the first and last authors, who contacted researchers in different countries of interest at pharmaceutical conferences. The three locations were purposefully chosen as they are comparable in terms of language, education and culture. The data collection method for Study 2 (international study) was the same as Study 1 (Australian study).

English proficiency is an essential criterion for admission in all participating universities. Such proficiency is measured either by International English Learning Testing System (IELTS) or Test of English as a Foreign Language (TOEFL) exams. [36-41]

Materials

The AGQ[6] (Appendix 1) and AGQ-R (Appendix 2)[26] (Elliot & McGregor, 2001; Elliot & Murayama, 2008) were used. Both questionnaires contain 12 items that are intended to measure the constructs underpinning achievement goal motivation, known as latent factors. In Elliot and McGregor's (2001) and Elliot and Murayama's (2008) models these are the four goal orientations (P-AP, M-AV, M-AP, and P-AV). The AGQ uses a 7-point Likert scale from 1 = Not at all true of me to 7 = Very true of me, and the AGQ-R uses a 5-point Likert scale from 1 = Strongly disagree to 5 = Strongly agree. The questionnaires were combined into one survey, a total of 24 questions. Socio-demographic indicators included in the survey were gender and age.

Analysis

SPSS 21 (SPSS Inc, Chicago, Illinois) was used for descriptive statistics regarding year group, gender and age for all participants. Confirmatory factor analyses, using AMOS 21.0 (SPSS; Chicago, IL) software, were conducted on the data for both the AGQ and AGQ-R to determine whether the data replicated the expected factor/scale structure. The analyses were conducted on covariance matrices, and the solutions were generated on the basis of maximum-likelihood estimation. No modifications were made to the model, which was a direct replication of the original model developed by Elliot and his colleagues (i.e. Elliot & McGregor, 2001; Elliot & Murayama, 2008).

The quality of any instrument is evaluated by its goodness of fit to the data.[42] The most commonly used and reliable fit indexes are the comparative fit index (CFI), Tucker-Lewis Index (TLI), chi-square degree of freedom ratio or normalized chi square (X^2/df), Akaike information criterion (AIC) and root-mean-square-error of approximation (RMSEA).[42-46]

On this basis, therefore, several indexes were used in this study to compare the fit of the models to the data: X^2/df, CFI, TLI, AIC and RMSEA. The following criteria were used to assess the adequacy of model fit: $X^2/df \leq 2.0$,[47] CFI $\geq$ 0.90,[48] TLI $\geq$ 0.90,[48] AIC - the minimum value of the two models[49] and RMSEA $\leq$ 0.08.[48]

Australian and UK sample sizes were sufficient to conduct separate confirmatory factor analyses. However, New Zealand and USA sample sizes were not (n < 5 participants per observed variable).[50] For this reason we combined both countries into one group (NZ/US). The Australian dataset was analysed first, followed by the UK and NZ/US dataset.

Results

Study 1: Australia

A total of 209 students (122 female and 78 male) with a mean age of 21.4 years completed the questionnaires (Table 1).

Table 1. Demographics of all participants.

Country	**Age (mean/S.D)**	**Gender (female/male)**	**Total N = 877**
Australia	21.40 / 2.49	122 (58%) / 78 Unspecified: 9	209
United Kingdom	20.80 / 1.81	311 (69.4%) / 132 Unspecified: 5	448
New Zealand	21.30 / 2.65	75 (71.4%) / 30	105
United States	25.80 / 1.59	67 (58.3%) /47 Unspecified: 1	114

Factor loadings and correlations:

The results of factor loadings for AGQ and AGQ-R are shown in Table 2. For the AGQ, the model shows overall high to very high loadings between observed indicators (questionnaire items) and their related latent factors ranging from λ = 0.67 to λ = 0.95. Similar results were obtained from the AGQ-R model. However, in this revised model one observed indicator (Item 3) in particular showed a weak relationship (λ= 0.49) with its latent factor (M-AV).

Table. 2 Factor Loadings: AGQ and AGQ-R.

Goal Orientation/Item	Australia	UK	NZ/US
Performance-Approach - AGQ			
1. It is important for me to do better than other students	0.95	0.90	0.94
2. It is important for me to do well compared to others in this class	0.91	0.89	0.91
3. My goal in this class is to get a better grade than most of the other students	0.90	0.83	0.87
Performance-Approach – AGQ-R			
1. I am striving to do well compared to other students	0.92	0.84	0.89
2. My aim is to perform well relative to other students	0.91	0.79	0.84
3. 3. My goal is to perform better than the other students	0.90	0.83	0.79
Performance-Avoidance- AGQ			
1. I just want to avoid doing poorly in this class	0.74	0.81	0.79
2. My goal in this class is to avoid performing poorly	0.91	0.89	0.85
3. My fear of performing poorly in this class is often what motivates me	0.67	0.54	0.62
Performance-Avoidance- AGQ-R			
1. My goal is to avoid performing poorly compared to others	0.82	0.75	0.67
2. I am striving to avoid performing worse than others	0.88	0.85	0.92
3. My aim is to avoid doing worse than other students	0.88	0.86	0.85
Mastery-Approach – AGQ			
1. I want to learn as much as possible from this class	0.83	0.79	0.79

2. It is important for me to understand the content of this course as thoroughly as possible	0.89	0.86	0.90
3. I desire to completely master the material presented in this class	0.78	0.71	0.78
Mastery-Approach – AGQ-R			
1. My aim is to completely master the material presented in this class.	0.70	0.71	0.72
2. My goal is to learn as much as possible.	0.85	0.79	0.81
3. I am striving to understand the content of this course as thoroughly as possible	0.85	0.67	0.69
Mastery-Avoidance – AGQ			
1. I worry that I may not learn all that I possibly could in this class.	0.81	0.79	0.78
2. Sometimes I'm afraid that I may not understand the content of this class as thoroughly as I'd like.	0.83	0.83	0.84
3. I am often concerned that I may not learn all that there is to learn in this class	0.93	0.95	0.92
Mastery-Avoidance – AGQ-R			
1. My aim is to avoid learning less than I possibly could.	0.73	0.81	0.82
2. My goal is to avoid learning less than it is possible to learn	0.80	0.79	0.79
3. I am striving to avoid an incomplete understanding of the course material.	0.49	0.52	0.59

As shown in Table 3, correlations between the latent factors in AGQ were weak, suggesting the presence of distinct constructs. In contrast, the correlations between the latent factors in the AGQ-R were somewhat higher, especially between M-AP and M-AV, and P-AP and P-AV constructs (Cronbach's α =0.84 and 0.79) respectively.

Fit indices

Table 4 shows the results of fit indices for both models. The AGQ model showed good fit for data (e.g. $\chi 2/df = 1.80$, RMSEA = 0.06). However, AGQ-R showed poor fit for the Australian data (e.g. $\chi 2/df = 2.58$, RMSEA = 0.09).

Study 2: UK and NZ/US

A total of 667 out of 721 students (92.5%) (483 female, 232 male and 6 preferred not to reveal their gender), with a mean age of 21.7 years,

Table 3 Factor correlations for AGQ/AGQ-R.

	Mastery-Avoidance	**Mastery-Approach**	**Performance-Avoidance**
Australia			
Performance-Approach	0.33/0.54	0.32/0.57	0.18/0.79
Mastery-Avoidance		0.40/0.84	0.26/0.64
Mastery-Approach			0.22/0.45
UK			
Performance-Approach	0.13/0.23	0.08/0.21	0.11/0.69
Mastery-Avoidance		0.24/0.35	0.06/0.50
Mastery-Approach			0.08/0.08
NZ/US			
Performance-Approach	0.03/0.25	0.21/0.34	-0.07/0.71
Mastery-Avoidance		0.24/0.41	0.02/0.44
Mastery-Approach			0.16/0.16

completed both questionnaires in this study. We deleted cases containing incomplete data (54 participants).[31] Descriptive statistics for the countries' participants are reported in Table 1.

Factor loadings and correlations:

Table 2 presents the factor loadings for AGQ and AGQ-R models. For AGQ, in UK and NZ/US samples, the model shows overall medium to high loadings between observed indicators and their related latent factors, ranging from λ = 0.94 to λ = 0.54. Similar factor loadings' results were obtained from AGQ-R (Table 2), with factor loadings ranging from λ = 0.92 to λ = 0.52.

In both the UK and NZ/US samples, the AGQ produced a weak correlation between the model's latent factors, thus suggesting the presence of distinct constructs (Table 3). However, the correlations between the latent factors (Table 3) were somewhat higher in the AGQ-R, especially between P-AP and P-AV constructs (Cronbach's α = 0.69 and 0.71 for UK and NZ/US respectively).

Fit indices

The AGQ model showed good fit for UK and NZ/US data (e.g. $\chi 2/df$ = 1.92, RMSEA = 0.05 for UK; $\chi 2/df$ = 1.65, RMSEA = 0.06 for NZ/US). However, AGQ-R showed poor fit for UK and NZ/US data (Table 4) (e.g. $\chi 2/df$ = 5.01, RMSEA = 0.09 for UK; $\chi 2/df$ =3.82, RMSEA = 0.11 for NZ/US).

Table 4. Goodness of fit summary* of AGQ and AGQ-R.

Australia	X^2/df	CFI	TLI	AIC	RMSEA
AGQ (2001)	1.80	0.98	0.97	138.81	0.06
AGQ-R (2008)	2.58	0.96	0.94	154.98	0.09
UK					
AGQ (2001)	1.92	0.98	0.98	152.15	0.05
AGQ-R (2008)	5.01	0.92	0.89	300.38	0.09
NZ/US					
AGQ (2001)	1.65	0.98	0.97	139.36	0.06
AGQ-R (2008)	3.82	0.90	0.86	243.39	0.11

* Recommended criteria: X2/df ≤ 2.0, CFI, TLI ≥ 0.90, AIC - minimum value of the two models; RMSEA ≤ 0.08

Discussion

Although the positive impact of achievement goal theory on education in general and higher education specifically is well known, measuring achievement goals in a precise manner is problematic.[5] The AGQ and AGQ-R are validated instruments widely used to assess students' achievement goals. In this study, our aims were to assess the construct validity of the AGQ and AGQ-R using a cohort of Australian pharmacy students in order to determine the most psychometrically appropriate version of the model, and assess the applicability and generalizability of both questionnaires across a range of pharmacy cohorts in English speaking countries.

In contrast to Elliot and Murayamas' (2008) findings, our results show the AGQ to be a more robust measure of pharmacy students' achievement goal orientations compared to the AGQ-R, in all six study sites. The factor loadings, correlations and fit indices all indicate that the AGQ demonstrates better construct validity when using an international pharmacy student cohort. Results indicate that students from six Schools of Pharmacy in four different countries were better able to understand and interpret the questionnaire items for the AGQ than the AGQ-R, that the AGQ is a more appropriate measure of achievement goals in our pharmacy cohorts, and that the AGQ is a more psychometrically robust measure than the AGQ-R.

Item 3 in particular "I am striving to avoid an incomplete understanding of the course material" appears to be problematic. It showed low factor loadings across all samples in our study (λ ranging from 0.49 to 0.59). Such a low factor loading may be attributed to the double negative construction of this item which is, in general, hard to understand.[51] Interestingly, this finding mirrors those reported by Hart et al (2013),[52] whose validation study utilizing a sample of African American high school students revealed that Item 3, with its latent factor M-AV, had a low factor loading ($\lambda = 0.42$). Furthermore, Hart et al (2013)[52] also found high correlations between achievement goal constructs in the AGQ-R, especially between P-AP and P-AV. These correlations suggest that the model cannot measure separate latent factors effectively. These results emphasize the importance of confirming the validation of measures of achievement goal motivation in different educational settings.

These findings, contradictory to those of Elliot and Murayamas' (2008) results, may be attributed to the differences between the cohorts used in the original validation study and the current study. To the best of our knowledge, there are no studies that compare pharmacy and psychology students' learning styles and achievement goals and therefore further work is warranted to better understand any differences between the two subject areas.

Limitations

In interpreting the study's findings, it is important to note to its limitations. The findings might not be generalizable to all pharmacy students as only four countries were included in this study. Additional construct validity studies for both questionnaires using pharmacy students from other cultures is required before we can generalize our findings globally. This study has laid a foundation for future studies into pharmacy students' achievement goals and will facilitate comparative and longitudinal research between different countries to better understand students' motivations

Conclusion

The AGQ met the criteria for a good-fitting model in the context under investigation, while the AGQ-R did not, which is in contrast to the findings of Elliot and Murayama (2008). Based on these results the research will proceed to cross-sectional and longitudinal studies of the goal orientations and approaches to learning of pharmacy students using the AGQ. Furthering our understanding of achievement goal constructs and their relevance to pharmacy education may facilitate future improvements to pharmacy education teaching and learning.

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Appendix 1. Elliot and McGregor AGQ.

1	2	3	4	5	6	7
Not at all true of me						Very true of me

1- It is important for me to do better than other students.	1	2	3	4	5	6	7
2- It is important for me to do well compared to others in this class	1	2	3	4	5	6	7
3- My goal in this class is to get a better grade than most of the other students.	1	2	3	4	5	6	7
4- I worry that I may not learn all that I possibly could in this class.	1	2	3	4	5	6	7
5- Sometimes I'm afraid that I may not understand the content of this class as thoroughly as I'd like.	1	2	3	4	5	6	7
6- I am often concerned that I may not learn all that there is to learn in this class.	1	2	3	4	5	6	7
7- I want to learn as much as possible from this class.	1	2	3	4	5	6	7
8- It is important for me to understand the content of this course as thoroughly as possible.	1	2	3	4	5	6	7
9- I desire to completely master the material presented in this class.	1	2	3	4	5	6	7
10- I just want to avoid doing poorly in this class.	1	2	3	4	5	6	7
11- My goal in this class is to avoid performing poorly.	1	2	3	4	5	6	7
12- My fear of performing poorly in this class is often what motivates me.	1	2	3	4	5	6	7

Appendix 2. Elliot and Murayama AGQ-R

1	2	3	4	5
Strongly Disagree				Strongly Agree

13- My aim is to completely master the material presented in this class	1	2	3	4	5
14- I am striving to do well compared to other students	1	2	3	4	5
15- My goal is to learn as much as possible	1	2	3	4	5
16- My aim is to perform well relative to other students	1	2	3	4	5
17- My aim is to avoid learning less than I possibly could	1	2	3	4	5
18- My goal is to avoid performing poorly compared to others	1	2	3	4	5
19- I am striving to understand the content of this course as thoroughly as possible	1	2	3	4	5
20- My goal is to perform better than the other students	1	2	3	4	5
21- My goal is to avoid learning less than it is possible to learn	1	2	3	4	5
22- I am striving to avoid performing worse than others	1	2	3	4	5
23- I am striving to avoid an incomplete understanding of the course material	1	2	3	4	5
24- My aim is to avoid doing worse than other students	1	2	3	4	5

Chapter 6: Identifying Achievement Goals and their Relation to Academic Achievement and Ethnicity in Undergraduate Pharmacy Students: A Comparative Cross-Sectional Study

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Authors' contribution

Saleh Alrakaf conducted the study, performed the statistical analysis, drafted and critically revised the manuscript. Erica Sainsbury, Grenville Rose and Lorraine Smith assisted with the statistical analysis and critically revised the manuscript.

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Erica Sainsbury

Grenville Rose

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Ethics approval and the supporting statistics outputs are in Appendix 4

Identifying Achievement Goals and their Relation to Both Academic Achievement and Ethnicity in Undergraduate Pharmacy Students: A Comparative Cross-Sectional Study.

ABSTRACT

Objectives: To compare the achievement goal orientations between First and Third year undergraduate Australian pharmacy students and their relation to academic achievement. To examine the influence of different ethnicity on achievement goals.

Methods: The Achievement Goal Questionnaire was administered to First and Third year students during tutorial class time. Students' marks were obtained from course coordinators. Descriptive statistics, ANOVA and logistic regression were employed to examine the strength and direction of relationships.

Results: First year students adopted Performance-Approach and mastery-approach goals more strongly than Third year students. Performance-Approach goal was positively correlated with academic achievement in First year. Chinese-Australian students scored the highest in adopting Performance-Approach goal. Vietnamese-Australian students adopted Mastery-Avoidance goal more than other ethnicities.

Conclusion: Adopting Performance-Approach goals was positively correlated with academic achievement, while adopting avoidance goals was not. First year students were more strongly approach goal-oriented than Third year

students. Ethnicity affects the adoption of achievement goals and academic achievement.

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INTRODUCTION

In academia, we might find a student who wants to learn as much as possible, interested in their subjects, and making efforts to understand hard materials. While, at the same time, and in the same classroom, we might find the totally opposite scenario. Why is that?

The role of goals in human motivation is critical.[1] Goals can be defined as a cognitive representation of future aims that a person is committed either to approach or avoid.[2] A class of goals that has received a considerable amount of attention in the educational field for more than two decades is achievement goals.[3, 4] From achievement goal theory's perspective, achievement goals are a specific type of goals in which "competence" is the main aim for an individual.[5] Thus, achievement goals are defined as "a future-focused cognitive representation that guides behavior to a competence-related end state that the individual is committed to either approach or avoid".[6] Achievement goal theory tries to describe and understand the goals students adopt when dealing with academic activities and the reasons behind such adoption.[7, 8] For example, when a student faces an academic activity, he/she adopts either one of the two major types of achievement goals; Mastery goals (i.e. to try to learn and understand the task on hand) or Performance goals (i.e. to try to perform well compared to his/her peers).[1, 9, 10]Achievement goal theorists believe that students who adopt mastery goals and students who adopt Performance goals view ability and define success versus failure very differently.[3]

Mastery students tend to view their abilities as a flexible trait that can be enhanced by hard work, persistence, and continuous development of their skills,[10] while students who adopt Performance goals view ability as a fixed trait that cannot be enhanced.[11] Performance students define success as outperforming their peers.[6] Thus, performance students who believe they have high ability will enjoy outperforming their peers, in contrast to students who believe they have low ability, and who will therefore avoid such challenges.[3] However, mastery students use self-referential criteria in differentiating between success and failure (i.e. feeling they learn what they need to learn or improve).[10]

In recent years, achievement goal theorists have further bifurcated mastery goals and Performance goals into 4 types: Mastery-Approach (M-AP) (i.e. aiming to learn and understand the task on hand thoroughly), Mastery-Avoidance (M-AV) (i.e. aiming to avoid losing previously acquired skills or not to understand the task on hand thoroughly), Performance-Approach (P-AP) (i.e. aiming to outperform one's peers or to demonstrate one's ability to others), and Performance-Avoidance (P-AV) (i.e. aiming to avoid performing worse than one's peers).[12-15] This distinction is supported by a large body of empirical research and is robust in predicting and understanding students' engagement and achievement.[6, 16, 17]

Researchers have found that the Mastery-Approach goal is linked to a number of positive effects such as deep learning,[18] high interest,[19] high persistence[20], and help seeking.[21] Interestingly, despite these beneficial effects, there is evidence to suggest that students who adopt this type of goal orientation rarely attain high academic achievement (i.e. grade marks).[6, 10] The Performance-Approach goal, on the other hand, is linked to different outcomes. It is associated with shallow learning strategies such as memorization[22], but also with high academic achievement.[8, 10, 23, 24] Performance-Avoidance and Mastery-Avoidance goals have been associated with negative effects, especially in Western culture, such as stress and anxiety,[25-27] low academic achievement,[28, 29] and low intrinsic motivation.[30, 31]

A strength of this theory of achievement motivation is its applicability across a range of educational domains. Measuring achievement motivation has been conducted extensively across a range of discipline areas in higher education. Importantly, however, these areas to date have not included pharmacy. Understanding student motivation enables academics to explore their students' motivational attributes and the findings can be used to inform and improve learning and teaching methods. Moreover, utilizing a theory and measuring instrument which are both replicable and empirically sound, adds rigor to the process and robustness of findings.

In general, cross-sectional studies designed to compare undergraduate students' achievement goals are scarce. However, there is some evidence which suggests that there are differences in the achievement goals adopted by students in different academic years. Lieberman and Remedios[32] examined the achievement goals of 1857 undergraduate students from First, Second, Third, and Fourth years who were studying in different disciplines such as psychology, business, biology, art, English, history, mathematics, and nursing at a Scottish university, and found that students in First year were more mastery oriented than students from any other years. The authors attribute their findings to increased pressure upon students as they advance through their academic life. This academic pressure undermines interest and enjoyment, and thus, significantly decreases pursuing Mastery-Approach goal. Another study conducted by Remedios et al[9] to identify and compare the achievement goals of Russian undergraduate students, who were taking an English studies course for business in different academic years, yielded strikingly similar results. However, the authors explained their results in light of the cultural shift that occurred in Russia by globalization which influenced students to be more individualistic and pragmatic, thus focusing more on performance as opposed to mastery goals.

The impact of culture and ethnicity on learning and achievement is an emerging issue in higher education settings. Globalization has meant that societies within each country are becoming increasingly multi-cultural. In Australia, for example, 26% of the population was born overseas.[33] Furthermore, in higher education settings, student cohorts comprise not only domestic but also international students.

Few studies have aimed to investigate the relationship between ethnicity and achievement goals.[34] For example, Elliot and his colleagues[35] found undergraduate psychology Asian-American students adopted Performance-Avoidance goal more than their Anglo-American peers. The authors attributed these findings to sub-cultural differences between the two groups. In general, students from Asian backgrounds valued avoiding negative outcomes, whereas approaching positive outcomes was valued in Anglo-American culture.[35] Similar findings have been found by Zusho et al.[36] However, the authors found that undergraduate Asian-American students outscored their Anglo-American peers in mathematics. These studies shed some light on the relationships between ethnicity and achievement goals and the effects of goals on academic performance. For example, based on the Elliot et al[35] findings, and achievement motivation theory, it could be hypothesized that ethnicity and goal orientation preference may influence academic achievement outcomes.

Although more than 1000 publications and dissertations report the application of achievement goal theory[6], only one of these (to our knowledge) is in the pharmacy education setting. Waskiewicz[37] used an achievement goal theory framework to determine students' motivations to achieve in a low stakes exam, compared to their motivations towards a Doctor of Pharmacy program. The author found a direct correlation between the motivation to achieve in the exam and both Performance-Approach and Mastery-Approach goals.

Achievement goal theory provides academics with invaluable understanding of how their students respond when they encounter academic activity.[29] By understanding students' achievement goals, academics might try to create an environment that can encourage those beneficial goals and limit the non-beneficial ones.[7] Yet the first step is to understand more about our students' achievement goals.

Therefore, the aims of this study were to 1) compare the achievement goal orientations between First year and Third year undergraduate pharmacy students; 2) investigate Australian undergraduate pharmacy students' achievement goals and their relation to their academic achievement in each year; and 3) examine the influence of different ethnicity on achievement goals.

METHODS

This study received approval from the Human Research Ethics Committee, The University of Sydney (Protocol No: 14741/ 17-04-2012), NSW Australia

Sample

The Bachelor of Pharmacy at the University of Sydney (Australia) is a 4-year undergraduate program that qualifies graduates to apply for registration as a pharmacist in Australia.[38] Students are eligible to enter this program directly after finishing high school if they meet the entrance requirements. The participants for this study were First and Third year undergraduate students in this program; in total, 380 students agreed to participate in the study.

Measures

The Achievement Goal Questionnaire (AGQ) (Appendix 1) was used to measure pharmacy students' goal orientations. This questionnaire, which is developed by Elliot and McGregor[13] in 2001, was the first instrument that incorporates the mastery avoidance goal into its model. This questionnaire has been validated by many scholars and found to be psychometrically robust".[6, 13, 16, 39] In addition, an international validation study conducted by Alrakaf et al[40] using undergraduate pharmacy students confirmed the validity of this questionnaire. The questionnaire contains 12 items intended to measure the four types of achievement goals (i.e. Performance-Approach, Performance-Avoidance, Mastery-Approach and Mastery-Avoidance) on a 7-point Likert scale (1= Not at all true of me to 7 Very true of me). Socio-demographic indicators included in the survey were: gender, age, language spoken at home, and student identification number (SID). SID numbers were used only for matching students' marks with the different types of achievement goals. Individual students could not be identified in the analysis.

Data regarding participants' ethnicities were gathered by asking students to indicate the language spoken at home. Languages spoken at home may be interpreted as more accurately reflecting the cultures of participants.[41] Culture is a variable of interest as it is the prism through which individuals view the world and may specifically affect their approach to education.[42] Another benefit of this question is that it enabled us to identify participants' ethnicities with greater precision. For example, instead of writing "Asian" in answering an ethnicity question, the participant will indicate the precise ethnicity when he/she identifies the language spoken at home as for example, Vietnamese, Korean, etc.

Procedure

The study was initiated in the second semester of the academic year 2012. Students were invited to participate in the study during normal lectures or tutorials. Students were advised that participation was voluntary and if they chose to participate they could withdraw from the study at any time. In addition, students were advised that their decision to participate would not impact on their academic performance results or influence student-teacher relationships. Researchers approached students as a group and not individually. At the end of the semester students' raw marks in two courses "Foundations of Pharmacy" (PHAR1811) and "Endocrine, Diabetes and Reproductive" (PHAR3813) were obtained from course coordinators.

PHAR1811 is a First year course aiming to introduce students to the pharmacy profession and the roles of pharmacists in the health care system.[43] PHAR3813 is a course taken in Third year which covers the pharmacotherapeutics of endocrine, diabetes and reproductive disorders.[43] Completion of the questionnaire took approximately 10 minutes.

Analysis

SPSS 20 (SPSS Inc, Chicago, Illinois) was used for all statistical analyses. Descriptive statistics regarding year group, gender, age, and language spoken at home are reported. Correlation analysis was used to determine the strength and direction of the relationships between achievement goals and academic achievement. An independent sample t-test was used to compare the achievement goal orientations between First and Third year students. One-way analysis of variance (ANOVA) was used as preliminary analysis for multiple comparisons of predominant languages spoken at home and each type of achievement goals. A two-way between-groups analysis of variance was conducted to explore the impact of students' academic year and predominant ethnicities on each achievement goal. Mean scores of achievement goals were used in all analyses. All mean difference analyses were subjected to post hoc tests (Tukey HSD test). Assumptions of normality were met using Levene’s test of homogeneity, except for the Mastery-Approach goal. For this goal orientation, a more stringent *p*-value of 0.01 was used to determine significance.[44]

A direct logistic regression procedure was performed to determine the extent to which achievement goals, age, gender and languages spoken at home contributed to academic achievement. Academic achievement was transformed into a binary variable using the mark 74 as a cut point. Thus students’ grades were regressed as Pass and Credit vs. Distinction and High Distinction. Predominant ethnicities were also transformed into a binary variable (Anglo-Australian/ Other Ethnicities). Forced Entry Method was used to examine the odds ratios of all variables, even if not significant. A *p* value of less than 0.05 was considered significant for all analyses.

RESULTS

Three hundred and eighty (251 females, 128 males, and 1 gender unspecified) undergraduate pharmacy students from years 1 and 3, with a mean age of 19.70 years for the sample, agreed to participate in this study (76% response rate). Descriptive statistics for participants are reported in Table 1.

Table 1. Participants' demographics

Academic year	***n***	**Gender**	**Age (*Mean/ SD*)**	**Languages (%)**
First year	260	67.7% Female	*18.8/ 2.12*	English 28.4 Chinese* 24.1 Vietnamese 15.2 Arabic 11.7 Korean 8.2 Other 12.4
Third year	120	62.5%	*21.5/ 3.56*	English 39.0 Chinese* 27.0 Korean 13.6 Vietnamese 8.5 Arabic 5.1 Other 6.8

*Chinese = Cantonese, Mandarin, Chinese, and Teochew Languages

Demographics

The predominant languages spoken at home (ethnicities) in both years were English, Chinese, Vietnamese, Korean, and Arabic, accounting for approximately 90% of students. The total number of reported ethnicities in First year and Third year were 22 and 13 respectively.

Relationships between achievement goals and year of study

Independent t-test results (Table 2) revealed differences between First year and Third year students in both Performance-Approach and Mastery-

Approach goals, with First year students scoring significantly higher than Third year students in both. In contrast, no significant differences were observed for Mastery-Avoidance or Performance-Avoidance goals.

Table 2. Independent t-test between First year and Third year students

	n	***Mean (S.D.)***	***p***	***t value***
Performance-Approach				
First year	260	5.06 (1.33)	0.000	3.55
Third year	120	4.52 (1.42)		
Performance-Avoidance				
First year	260	5.64 (1.29)	0.251	1.15
Third year	120	5.48 (1.28)		
Mastery-Approach				
First year	260	5.89 (1.00)	0.010	2.60
Third year	120	5.57 (1.19)		
Mastery-Avoidance				
First year	260	4.81 (1.47)	0.145	1.46
Third year	120	4.57 (1.40)		

Means differ significantly at $p < 0.05$

Relationships between achievement goals and academic achievement:

Correlations between achievement goals and marks are reported in Table 3.

Table 3. Marks-achievement goals correlations.

Year	*n*			Performance-Approach	Performance-Avoidance	Mastery-Approach	Mastery-Avoidance
1	260	**Marks**	*r*	0.135	-0.139	0.064	-0.072
			P	0.037*	0.031*	0.323	0.266
3	120	**Marks**	*r*	0.050	-0.183	-0.160	-0.308
			P	0.607	0.055	0.094	0.001**

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

In First year, the results show that higher scores on Performance-Approach goal were associated with higher marks $r = 0.135$, $p = 0.037$. In the same year, adoption of Performance-Avoidance goal significantly correlated with lower marks $r = -0.127$, $p = 0.031$. In Third year, adoption of Mastery-Avoidance goal significantly correlated with lower marks $r = -0.308$, $p = 0.001$.

Ethnicity and achievement goals

Although collapsing different Asian ethnicities (i.e. Chinese, Vietnamese, and Korean) into one group has statistical appeal, yielding greater power, a one-way between group analysis of variance reveals statistically significant differences at the $p < 0.05$ level in Performance-Approach and Mastery-Avoidance and academic achievement scores for the three ethnic groups: *F*

(2, 177) = 5.60, $P = 0.004$, F (2, 177) = 4.90, $P = 0.008$, F (2,162) = 4.40, P = 0.014 respectively. Thus, each predominant Asian ethnicity was analyzed separately.

A two-way between-groups analysis of variance was conducted to explore the impact of students' academic year and predominant ethnicity on each achievement goal. Ethnic differences in mean levels of goals and year are reported in Table 4.

Regarding the Performance-Approach goal, both academic year F (1, 325) = 6.52, and ethnicity F (4, 325) = 3.97, had significant impact, $p = 0.011$, p = 0.004 respectively. Post-hoc comparisons of the main effect using the Tukey HSD test indicated that Chinese-Australian students reported higher Performance-Approach goal than their Anglo and Korean Australian peers. No significant interaction was found between the predominant ethnicities and students' academic year, F (4, 325) = 0.35, $p = 0.844$.

No significant impact was found from academic year F (1, 325) = 0.32, p = 0.571, or predominant ethnicity F (4, 325) = 0.89, $p = 0.473$ on Performance-Avoidance goal. The interaction effect between predominant ethnicity and academic year was not statistically significant, F (4, 325) = 1.38, $p = 0.241$.

Only academic year F (1, 325) = 7.79 had a significant impact on Mastery-Approach goal, $p = 0.006$. The interaction effect between predominant ethnicity and academic year was not statistically significant, $p = 0.377$.

The impacts of academic year F (1,325) = 4.53, and ethnicity F (4, 325) = 5.65 the upon Mastery-Avoidance goal were significant, $p = 0.034$, $p = <0.001$

respectively. Post-hoc comparisons using the Tukey HSD test indicated that Vietnamese-Australian students reported higher adoption of the Mastery-Avoidance goal than their Anglo and Arab Australian peers. The interaction effect between predominant ethnicity and academic year was not statistically significant, $F(4, 325) = 0.49$, $p = 0.744$.

Table 4. Ethnic and year group differences in mean scores (standard deviation) of goal orientations.

Goals *n* = 1st yr/3rd yr	Anglo 73/46	Chinese 62/32	Vietnamese 39/10	Korean 21/16	Arabic 30/6
	M *(S.D.)*	M *(S.D.)*	M *(S.D.)*	M *(S.D.)*	M *(S.D.)*
Performance-Approach					
Year 1	4.85 *(1.48)*	5.31 *(1.15)*	5.40 *(1.12)*	4.55 *(1.55)*	4.70 *(1.39)*
Year 3	4.42 *(1.55)*	5.01 *(1.15)*	4.50 *(1.37)*	4.31 *(1.34)*	4.44 *(1.31)*
Performance-Avoidance					
Year 1	5.57 *(1.31)*	5.65 *(1.23)*	5.93 *(1.08)*	5.81 *(1.35)*	5.27 *(1.51)*
Year 3	5.59 *(1.26)*	5.36 *(1.18)*	5.77 *(1.26)*	5.31 *(1.13)*	6.28 *(0.80)*
Mastery-Approach					
Year 1	6.01 *(0.96)*	5.84 *(0.81)*	5.99 *(1.08)*	5.39 *(1.41)*	5.65 *(1.12)*
Year 3	5.49 *(1.27)*	5.32 *(1.17)*	5.84 *(0.97)*	5.65 *(0.96)*	4.44 *(1.31)*
Mastery-Avoidance					
Year 1	4.64 *(1.62)*	5.11 *(1.11)*	5.53 *(1.25)*	4.52 *(1.49)*	4.27 *(1.56)*
Year 3	4.19 (1.48)	4.73 (1.29)	4.84 (1.25)	4.60 (1.18)	4.33 *(0.92)*

Direct logistic regression was performed to assess the impact of a number of factors on the students' marks (academic achievement). The model contained seven independent variables (Performance-Approach, Performance-Avoidance, Mastery-Approach, Mastery-Avoidance goals, age, gender and ethnicity). The full model containing all predictors was statistically significant, $\chi 2$ (7, N = 349) = 22.906, p = 0.002. The model as a whole explained between 6.4% (Cox and Snell R square) and 8.6% (Nagelkerke R squared) of the variance, and correctly classified 62.3% of cases.

As shown in Table 5, three of the independent variables made a unique statistically significant contribution to the model (female gender, Mastery-Avoidance, and other-ethnicity). The strongest predictors of grades were Mastery-Avoidance goal and Other ethnicity, with odd ratios of 0.826 and 0.572 respectively. This indicated that students who pursued Mastery-Avoidance goals were less likely to gain high marks than those who did not pursue this goal, and students from ethnicities other than Anglo-Australian were less likely to gain high marks as well, controlling for all other factors in the model. Being female student was also significantly predictive of higher academic achievement, p = 0.030.

Table 5. Logistic regression predicting academic achievement.

	B	S.E.	*p*	Odds Ratio	95% C.I. for EXP(B)	
					Lower	Upper
Age	-0.046	0.046	0.319	0.955	0.872	1.046
Females	0.563	0.260	**0.030**	1.756	1.056	2.922
PAP	0.073	0.086	0.395	1.076	0.909	1.273
PAV	-0.157	0.090	0.082	0.854	0.716	1.020
MAP	-0.113	0.112	0.310	0.893	0.717	1.111
MAV	-0.191	0.085	**0.024**	0.826	0.700	0.975
Other-ethnicities	-0.558	0.248	**0.024**	0.572	0.352	0.930
Constant	1.446	1.177	0.219	4.245		

The overall model is significant at $P < 0.05$

DISCUSSION

For more than two decades, achievement goal theory has captured a considerable amount of attention in education, with more than 1000 articles and dissertations being written using it as a framework.[3, 4, 6] Four types of achievement goals are acknowledged: Mastery-Approach, Mastery-Avoidance, Performance-Approach, and Performance-Avoidance goals.[12-15] The primary aims of this study were to identify Australian undergraduate pharmacy students' achievement goals, the relationships between goals and academic achievement, and to compare the achievement goals of two different cohorts of undergraduate students. A secondary aim of this study was to investigate any relationships between ethnicity, type of achievement goals, and academic achievement.

Comparison of First and Third year students' goal orientations showed that First year students were oriented more strongly toward Performance-Approach and Mastery-Approach goals than Third year students. Our finding that First year students adopt Mastery-Approach goal more than Third year students is consistent with Lieberman and Remedios[32] and Remedios et.al[9] findings. However, our findings regarding the Performance-Approach goal differed from Remedios et al.'s[9] results, who found no significant differences between First, Second Third and Fourth years adoption of the Performance-Approach goal and Lieberman and Remedios who found Third year students adopted the Performance-Approach goal more than First year students. The higher adoption of Performance-Approach goal by First year students compared to Third year students might be due to the remaining influence of the competitive environment that Australian First year students were accustomed to in their high schools. Students in their final year of high school are provided with extensive lists of detailed learning outcomes which tend to foster a teaching environment that teaches to the test and discourages mastery orientation.

Our results show that First year students who adopted Performance-Approach goals gained higher marks in their subject compared to their peers who adopted any other type of achievement goals. These findings are consistent with several previous studies that indicate the positive association between Performance-Approach and academic achievement.[8, 10, 23, 24, 28, 29, 45] It might be that students who adopt a strong Performance-Approach goal orientation focus upon topics that appear to be important and testable for their teachers. In contrast, students who are strongly mastery-oriented are more likely to follow their own interest and study subject material that is appealing to them regardless of its testability.[46] Almost every academic wants their students to be curious, interested and use deep learning strategies (i.e. adopting a Mastery-Approach goal) when they study their course, and at the same time attain as high marks as possible according to their individual potential (i.e. adopting a Performance-Approach goal). Although reaping the benefits of both types of achievement goals is clearly beneficial, the question is how can we foster the combination of both goal orientations? One way is by helping students pursue Mastery-Approach goal through the semester and then encouraging them to pursue Performance-Approach goals when preparing for the exams[19]. This can be achieved through appropriate curriculum development, and gaining a knowledge of the complementary academic teacher qualities that would enhance and support the delivery of the course curricula[19]. These qualities if adopted by academics might help create Mastery-Approach and Performance-Approach goals environment.

Surprisingly, in Third year, there was no significant relationship between academic achievement and the Performance-Approach goal. This result was inconsistent with previous research findings .[8,22,23,27-30] Although our data did not allow us to elucidate why there was no positive relationship between academic achievement and Performance-Approach, we posit that the nature of the examined course (i.e. Endocrine, Diabetes and Reproductive) does not support shallow learning strategies such as memorization. Thus, adoption of this type of achievement goals had no significant association with academic achievement.

In contrast to much of the published literature[34, 35, 47, 48] which has grouped different Asian ethnicities under one umbrella and applied their findings to the whole group, our study clearly revealed that individual Asian ethnicities varied in their adoption of each type of achievement goal. Vietnamese students, for example, had significantly higher scores on the Mastery-Avoidance goal than their Korean peers, whereas Chinese students had significantly higher Performance-Approach goal scores than Korean students. To the best of our knowledge, this study is the first to analyze each Asian ethnicity separately, and this separation has yielded significant conclusions. In contrast to the Zusho et al[36] study that did not find any significant difference between Asian and Anglo American students in pursuing Performance-Approach goals, our study shows that Chinese-Australian students were significantly adopting Performance-Approach goals more than their Anglo-Australian peers. However, there were no significant differences between Anglo-Australian students and other Asian-Australian students (i.e. Vietnamese and Korean students). For Chinese-Australian students, Possessing higher scores on Performance-Approach goals than Anglo-Australian students might be in response to their parents' expectations of high academic Performance from their children.[48] Our finding that Vietnamese-Australian students adopted Mastery-Avoidance goal more than their Anglo-Australian peers was consistent, to some degree, with literature that found Asian students are more inclined to adopt avoidance goals than Caucasian students.[34, 35, 49]

The contradictory findings of this study in comparison with previous research may be attributed to three factors. Firstly, this study has made a clear distinction between different Asian ethnicities while most other studies have not. This suggests that a "One group fits all" approach when dealing with different Asian ethnicities misses the opportunity to more precisely understand different ethnic groups. Secondly, most of the published literature focuses on upon psychology students (see for example Elliot et al,[35] and Zusho et al[36]). It might be that there is a correlation among discipline-specific subjects, achievement goals and academic achievement. Thirdly, this study was conducted in Australia. Given the multicultural nature of Australian, and particularly Sydney based, society, the current study suggests that there may be no single strategy that may fit Australian students and that future work should address cultural differences more directly.

FUTURE RESEARCH:

This study was important in identifying undergraduate pharmacy students' achievement goals and their relation to academic achievement. In addition, this study sheds some light upon the relationship between different ethnicities and achievement goals. As quantitative studies do not answer the question *why* such phenomena occur, a qualitative investigation of this phenomenon may yield useful additional results. In-depth interviews with a purposive sample of students who participated in this study may yield more information regarding why students pursue one achievement goal over another, in addition to other questions such as the nature of the relationship between academic achievement and the Performance-Approach in Third year students and ethnic differences. Further, understanding the qualities that Mastery and Performance Approach students would like to see in their academic instructors will help academics to amend their practices to create an environment that can foster the adoption of both goals. Following these two cohorts longitudinally for another academic year will provide evidence regarding the stability of these goals over time and their relation to academic achievement and ethnicity**.**

LIMITATIONS

A limitation of this study was using cohorts from only one university. A study which comprises Australian undergraduate pharmacy students from different universities would be preferred in order to generalize our results.

CONCLUSION:

This is the first study of its kind conducted into undergraduate pharmacy students' achievement goal orientations, academic performance and ethnicity. We hope this study will act as a starting point for academics to review their pedagogical practices in a way that can encourage the adoption of productive Approach-goal orientations and discourage the adoption of unproductive Avoidance-goal orientations in their students.

Adopting Performance-Approach goals positively correlated with academic achievement, while adopting either Performance-Avoidance or Mastery-Avoidance goal did not. First year students were more Performance-Approach and Mastery-Approach oriented than Third year students. Ethnicity affected achievement goals and academic achievement. Chinese-Australian students indicated stronger preferences for adopting Performance-Approach goals, whereas, Vietnamese-Australian students adopted Mastery-Avoidance goal more than any other ethnicities.

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Appendix 1. Elliot and McGregor AGQ.

1	2	3	4	5	6	7
Not at all true of me						Very true of me

1- It is important for me to do better than other students.	1	2	3	4	5	6	7
2- It is important for me to do well compared to others in this class	1	2	3	4	5	6	7
3- My goal in this class is to get a better grade than most of the other students.	1	2	3	4	5	6	7
4- I worry that I may not learn all that I possibly could in this class.	1	2	3	4	5	6	7
5- Sometimes I'm afraid that I may not understand the content of this class as thoroughly as I'd like.	1	2	3	4	5	6	7
6- I am often concerned that I may not learn all that there is to learn in this class.	1	2	3	4	5	6	7
7- I want to learn as much as possible from this class.	1	2	3	4	5	6	7
8- It is important for me to understand the content of this course as thoroughly as possible.	1	2	3	4	5	6	7
9- I desire to completely master the material presented in this class.	1	2	3	4	5	6	7
10- I just want to avoid doing poorly in this class.	1	2	3	4	5	6	7
11- My goal in this class is to avoid performing poorly.	1	2	3	4	5	6	7
12- My fear of performing poorly in this class is often what motivates me.	1	2	3	4	5	6	7

Chapter 7: Do achievement goals change over time?

7.1 Introduction

The studies reported thus far in this thesis have explored students' preferences and motivations for learning in an undergraduate pharmacy degree program. Differences between students and their teachers regarding their views on independent learning emerged from a preliminary qualitative investigation (Chapter 4), prompting the development of a program of research to explore aspects of student achievement motivation and how this influences academic performance.

A theoretical approach to this work was adopted, whereby a theory of achievement motivation was used to underpin the exploration of students' goals and academic performance. To re-cap, contemporary thinking proposes four types of achievement goals. These are: (1) mastery-approach, where the individual's aim is to understand and learn the task on hand thoroughly; (2) mastery-avoidance, where the individual's aim is to avoid not understanding and learning the task on hand thoroughly; (3) performance-approach, where the individual's aim is to outperform others or appear talented either in front of teachers or his/her peers; and (4) performance-avoidance, where the individual's aim is to avoid doing worse than others or appear less talented (Huang, 2012; Hulleman et al., 2010).

The mastery-approach goal has been associated with a number of beneficial outcomes such as high interest in subjects, high self-regulation, high ability to work as a group and retention of course materials long after examinations

(Harackiewicz et al., 2002; Harris et al., 2008; Wolters, 2004). However, despite such positive effects, adopting this type of achievement goal does not correlate with high academic performance (Hulleman et al., 2010). The avoidance types of achievement goals (i.e., mastery-avoidance and performance-avoidance) have been linked to negative outcomes such as anxiety, depression and low academic achievement (Linnenbrink-Garcia et al., 2012; Murayama and Elliot, 2012; Putwain and Symes, 2012). The performance-approach goal has been linked to negative and positive outcomes. Negatively, it has been linked to memorization and anxiety, (Vrugt and Oort, 2008) positively, it has been linked to high academic performance (Hulleman and Senko, 2010). Despite the positive effect of the performance-approach goal on students' marks, most academics stress the benefits that students can gain by adopting the mastery-approach goal (Belenky and Nokes-Malach, 2012; Kaplan et al., 2002b).

Of the few achievement motivation studies conducted in the pharmacy field, the bulk is contained within this thesis. Alrakaf and colleagues (In Press-a) used a sample of pharmacy students from USA, Wales, England, New Zealand and Australia to validate two commonly used achievement goal questionnaires - the Achievement Goal Questionnaire (AGQ) (Elliot and McGregor, 2001) and the Revised Achievement Goal Questionnaire (AGQ-R) (Elliot and Murayama, 2008) - which were designed to examine undergraduate students' achievement goals. The authors found that the AGQ was a more robust measure of pharmacy students' achievement goals than the AGQ-R (Alrakaf et al., In Press-a). Based on the results of this study, Alrakaf and colleagues (In Press-b) conducted another study to investigate Australian undergraduate pharmacy students' achievement goals and to compare the achievement goals of first and third year students and their relation to academic achievement. The study revealed that first year students adopted the approach type of achievement goals more strongly than third year students. In addition, the authors found that the performance-approach goal is positively correlated to higher marks (Alrakaf et al., In Press-b).

Given these cross-sectional studies so far, the logical extension to the study of achievement motivation is to examine the extent to which students' achievement goals change over time. Longitudinal studies designed to assess changes in achievement goal orientations are scarce. Senko and Harackiewicz (2005), for example, examined the regulation of three of the achievement goals (i.e. mastery-approach, performance-approach and performance-avoidance goals) in a sample of undergraduate psychology students who received feedback on their academic performance during one semester. The authors found a complex interaction between goal stability and goal change, depending on the whether the performance feedback students received was positive or negative. In a second study, using a sample of undergraduate psychology students to assess changes in mastery-approach, performance-approach and performance-avoidance goals over the relatively short timeframe of 15 weeks, Fryer and Elliot (2007) found that the mastery-approach goal orientation significantly decreased over time while the performance-avoidance goal orientation increased over the same period. No significant changes were found in students' performance-approach goal orientation.

Although these studies provide some insight into the extent which changes may occur in achievement goals over time, there are some limitations to these studies. Firstly, they were conducted using samples of students from a different discipline (psychology). Secondly, the mastery-avoidance goal orientation was not investigated in either of these studies. Thirdly, the timeframe for these longitudinal studies was relatively short - just one semester's length.

In light of these limitations and the opportunity afforded by the doctoral program of research a longitudinal analysis was conducted. The aim was to follow two cohorts of Australian undergraduate pharmacy students (cohort I, from year one to year two; and cohort II, from year three to year four) to explore the changes that may occur in their achievement goals over time.

7.2 Methods

This study received approval from the Human Research Ethics Committee, The University of Sydney (Protocol No: 14741/ 17-04-2012), Australia.

Sample and procedures

All students were undergraduate pharmacy students enrolled in a four-year Bachelor of Pharmacy Program at the University of Sydney, Australia.

Students were invited to participate in the study during normal lectures or tutorial times. Students were advised that participation was voluntary and they could withdraw from the study at any time. Data were collected using a self-report measure twice over a period of one year. The first was in semester two of 2012 and the second was in semester two of 2013.

Measures

The Achievement Goal Questionnaire (AGQ) which has been internationally validated in pharmacy education settings (Alrakaf et al, In Press-a) was used to measure pharmacy students' goal orientations at both times (Appendix 5). The questionnaire contained 12 items intended to measure the four types of achievement goals on a seven-point Likert scale (one = "not at all true of me", to seven = "very true of me"). Socio-demographic indicators included in the survey were gender and age.

Analysis

SPSS 21 (SPSS Inc., Chicago, Illinois) was used for all statistical analyses. A paired sample *t* test was used to test for differences in achievement goals between time 1 and time 2 in both cohorts.

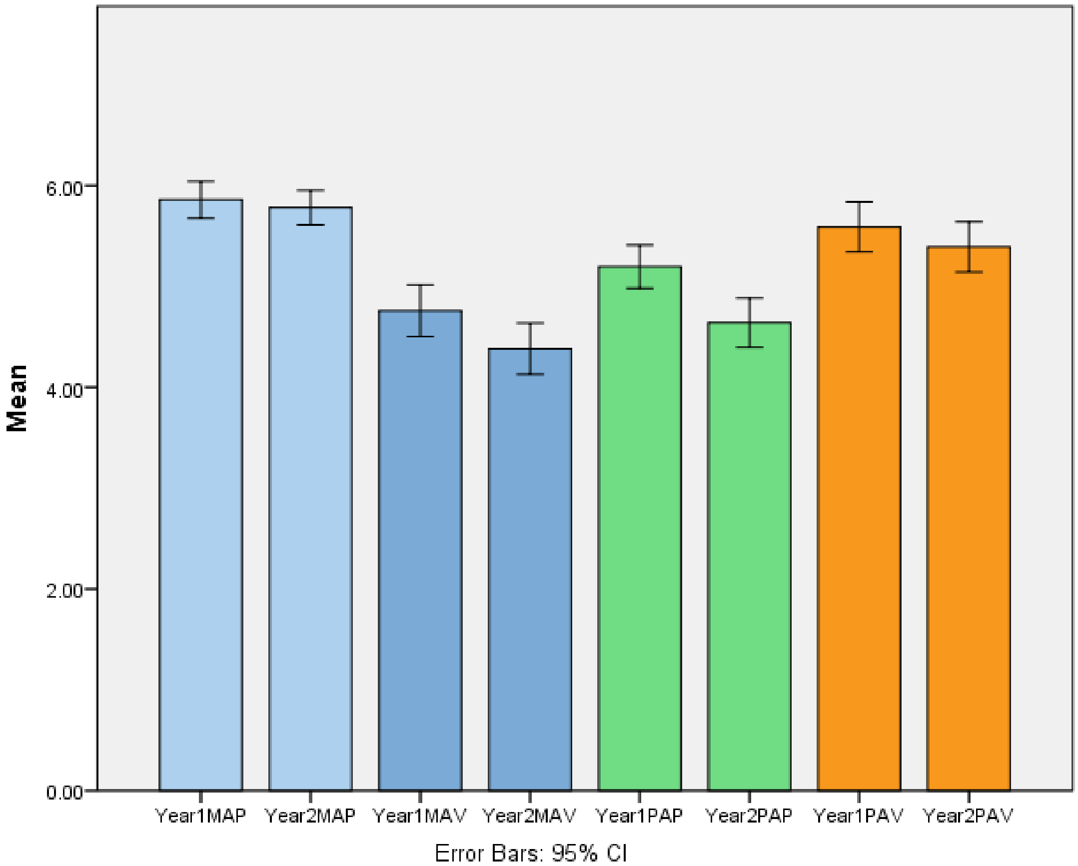
7.3 Results

After listwise deletion of missing cases, 193 under graduate pharmacy students' achievement goals scores were analysed. The sample of cohort I comprised 126 first-year students (95 females and 31 males) (76% response rate) and the sample of cohort II comprised 67 third-year undergraduate pharmacy students (44 females and 23 males) (40% response rate).

Cohort I

Paired sample *t* test (Figure 1) revealed that the scores of the performance-approach goal significantly decreased from year one (*M* = 5.20, *SD* = 1.21) to year two (*M* = 4.64, *SD* = 1.39), *t* (125) = 3.38, *p* = 0.001. In addition, the test revealed that scores on the mastery-avoidance goal also decreased from year one (*M* = 4.76, *SD* = 1.45) to year two (*M* = 4.38, *SD* = 1.44), *t* (125) = 2.02, *p* = 0.046. No significant changes were observed in students' scores on either mastery-approach or performance-avoidance goals from year one to year two.

Figure 1. Achievement goals - change from year one to year two



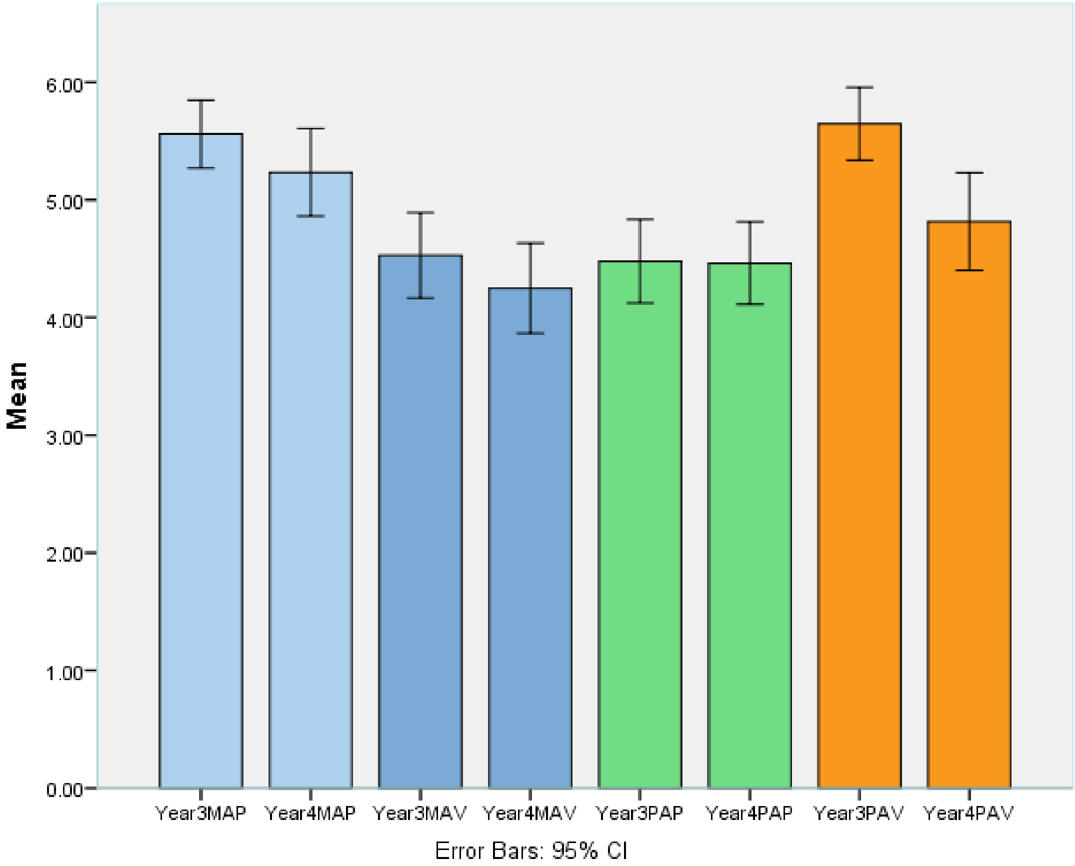
MAP:	Mastery-approach goal	Year 1 (*5.86*/1.03)	Year 2 (*5.78*/0.98)
MAV:	Mastery-avoidance goal	Year 1 (*4.76*/1.45)	Year 2 (*4.38*/1.44)
PAP:	Performance-approach goal	Year 1 (*5.20*/1.21)	Year 2 (*4.64*/1.39)
PAV:	Performance-avoidance goal	Year 1 (*5.59*/1.40)	Year 2 (*5.39*/1.41)

(*Mean*/S.D)

Cohort II

Paired sample *t* test (Figure 2) revealed that students' scores on the performance-avoidance goal significantly decreased from year three (M = 5.65, SD = 1.28) to year four (M = 4.82, SD = 1.70), t 66 = 3.14, p = 0.003. There were no other significant changes over time in any other types of achievement goals.

Figure 2. Achievement goals - change from year three to year four



MAP:	Mastery-approach goal	Year 3 (*5.56*/1.18)	Year 4 (*5.23*/1.53)
MAV:	Mastery-avoidance goal	Year 3 (*4.53*/1.49)	Year 4 (*4.25*/1.57)
PAP:	Performance-approach goal	Year 3 (*4.48*/1.45)	Year 4 (*4.46*/1.44)
PAV:	Performance-avoidance goal	Year 3 (*5.65*/1.28)	Year 4 (*4.82*/1.70)

(*Mean*/S.D)

7.4 Discussion

This study was the first to assess change in the achievement goal orientations of undergraduate pharmacy students over time, and it is the first to investigate the changes that may occur in the mastery-avoidance goal.

The results of the longitudinal study revealed significant declines in first year students' scores on the performance-approach and mastery-avoidance goals over time. Third year students' scores on the performance-avoidance goal similarly declined significantly. No other significant changes in goal orientation over time were found for either group.

The earlier cross-sectional study conducted into pharmacy students' goal orientations revealed that first year students had a stronger preference for the performance approach goal orientation than their third year counterparts (Alrakaf et al., In Press-b). It was proposed that the reason for this might be explained by the bulk of the first year students having just the year before completed a highly competitive final year of high school, where they are provided with extensive lists of detailed learning outcomes. This strong outcomes focus tends to foster a learning and teaching environment that 'teaches to the test' rather than mastering the task at hand (Alrakaf et al., In Press-b). The longitudinal results thus may be indicating that this focus by the students on out-performing their peers may have declined by the end of second year at university. The fact that the mastery-approach goal orientation score remained unchanged over time, *and* with the highest score compared to the other goals, was both pleasing and indicative of an overall preference by students for a positive mastery orientation to their studies. In light of the negative consequences of adopting a mastery-avoidance goal orientation, the finding that students' scores for this goal orientation decreased from first year to second year is also a pleasing result.

Similarly pleasing was the significant decline in performance-avoidance goal scores from year three to year four. This type of achievement goal is associated with a number of negative outcomes such as anxiety, cheating and poor academic performance (Hulleman et al., 2010; Murayama et al., 2012).

The pattern of a sustained mastery-approach goal orientation over time identified in Cohort I was reflected in Cohort II. This strong mastery orientation across the undergraduate program of study indicates an overall preference for adopting deeper approaches to learning with a concomitant move away from preferences for out-performing one's peers or adopting avoidance-type strategies for learning.

Limitations and future research

Using two pharmacy cohorts from one institution (i.e., the University of Sydney) was a limitation for this study. However, the University of Sydney is the only university in the Sydney region that offers a bachelor program in pharmacy. The response rate of Cohort II was low and thus the data may not be a good representation of that cohort. A parallel qualitative investigation of the reasons behind the apparent change in students' achievement goals would have been ideal in the research process. In-depth interviews with a purposive sample of students who participated in this study may provide more insight into why some achievement goals had changed over time while others had not.

The positive improvements found in this study might be due to the achievement goals adopted by students' teachers. This emerging field of research suggests that teachers who strongly adopt the mastery-approach goal can foster the adoption of the same goal in their students (Kaplan et al., 2002a; Shim et al., 2013). A study into pharmacy teaching academics' goal preferences would be a valuable contribution to this field of enquiry.

7.5 Concluding comments

A preliminary investigation into the possible relationships between these changes over time and their relationship with students' academic performance outcomes revealed a highly complex interplay between goals, marks, cohorts and time. To properly disentangle the interaction effects between the variables of interest requires a lengthy and careful investigation which did not fit into the timeframe of this program of research and thus are not reported in this thesis. This important issue warrants further investigation and will be undertaken at a later date. The results of this longitudinal study also give a strong suggestion that students' preferences for goal orientations are not an either/or phenomena. The role of multiple goals is another aspect of achievement goal research ripe for future investigation.

Chapter 8: An International Comparison Study of Pharmacy Students' Achievement Goals and their Relationship to Assessment Type and Marks

Alrakaf, S., Anderson, C., Coulman, S., John, D., Tordoff, J., Sainsbury, E., Rose, G. & Smith, L. (In Press-c) An International Comparison Study of Pharmacy Students' Achievement Goals and their Relationship to Assessment Type and Marks. *American Journal of Pharmaceutical Education*.

Authors' contributions

Saleh Alrakaf conducted the study, performed the statistical analysis drafted and critically revised the manuscript. Claire Anderson, Sion Coulman, Dai John and June Tordoff obtained ethics approvals from their institutions, administered the questionnaires and critically revised the manuscript. Erica Sainsbury, Grenville Rose and Lorraine Smith assisted with the statistical analysis and critically revised the manuscript.

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June Tordoff	Erica Sainsbury	Grenville Rose	Lorraine Smith

Ethics approval and all supporting statistics are in Appendix 6.

An International Comparison Study of Pharmacy Students' Achievement Goals and their Relationship to Assessment Type and Scores.

Abstract

Objectives: To 1) identify pharmacy students' preferred achievement goals in a multi-national undergraduate population; 2) investigate achievement goal preferences across comparable degree programs; 3) identify the relationships between achievement goals, academic performance and assessment type.

Methods: The Achievement Goal Questionnaire was administered to second year students in four universities in Australia, New Zealand, England and Wales. Academic performance was measured using total scores, multiple choice questions (MCQ) and written answers (short essay).

Results: A total of 486 second year students participated. Students showed an overall preference for the Mastery-Approach goal orientation across all sites. The predicted relationships between goal orientation and MCQ, and written answers scores, were statistically significant.

Conclusion: This study is the first of its kind to examine pharmacy students' achievement goals at a multi-national level, and to differentiate between assessment type and measures of achievement motivation. Students adopting a Mastery-Approach goal are more likely to gain high scores in assessments that measure understanding and depth of knowledge.

An International Comparison Study of Pharmacy Students' Achievement Goals and their Relationship to Assessment Type and Scores.

INTRODUCTION

The quality of student learning and motivation is of great interest to tertiary educators, and considerable effort is currently devoted to evaluating that quality, and seeking ways to enhance it. Research that seeks to understand the relationships between student motivation and their academic performance is essential to this endeavor.

Achievement goal theory has been an important framework used to study undergraduate students' motivation. Achievement goal theorists posit that students pursue one of two broad types of goals when they face any academic activity. They either try to understand this activity as much as possible (mastery goal) or they try to compete with each other (performance goal).[1] Gaining competence is the main reason for pursuing either goal.[2] Competence is viewed differently by students depending on their goal orientation. Students who adopt the mastery goal believe that competence can be gained by understanding the task at hand as thoroughly as possible and seeking help when they need it.[3] They use self-referential standards to differentiate between success and failure.[3] Students who adopt a performance goal, on the other hand, believe competence is gained by outperforming their peers and appearing talented in front of their teachers.[4] These students adopt their teachers' standards of success and failure.[5]

These two types of achievement goals are further subdivided into four types: (1) mastery-approach (M-AP), where the individual is motivated to learn or improve skills; (2) mastery-avoidance (M-AV), where the individual is motivated to avoid learning failures or declines in skill; (3) performance–approach (P-AP), where the individual is motivated to outperform others; and (4) performance-avoidance (P-AV), where the individual is motivated to avoid doing worse than others.[6, 7]

Research conducted with undergraduate students from disciplines such as psychology, sociology, business, biology and art has investigated the impact of achievement goals on students' interest in academic activities, academic achievement (for example, scores), anxiety, surface learning (for example, memorizing), and help seeking.[4, 8, 9] The results regarding M-AV and P-AV are consistent in terms of their negative effects on students, such as poor scores, low interest in the subject, anxiety, and cheating.[10-12]

In contrast, the M-AP goal has been linked to many positive attributes, such as deep learning strategies,[13] high interest in the subject,[14] and seeking help when needed.[15] From the teacher's perspective, this goal orientation is highly valued. Despite these positive effects, however, empirical research has to date found no significant relationships between this goal and academic achievement.[4] Adopting a P-AP has been linked to mixed outcomes. For example, students who adopt this goal have been found to use surface learning strategies such as memorization and to be more anxious.[16-18] Other studies have found that students adopting this goal orientation achieve higher scores in their exams.[3, 19]

What is currently missing from the research literature on goals and academic performance is an exploration of the types of examination undertaken. In universities, different types of assessments are intended to assess students' knowledge, such as oral, essay and multiple choice question (MCQ) exams. Each of these exam types has its own advantages and disadvantages. For example, an advantage of essay style exams is their capacity to assess deep understanding and critical thinking, while a disadvantage is its relative subjectivity when scoring.[20] MCQ exams, however, address this subjectivity by limiting the answer to "one correct" answer, yet this method promotes surface approaches to learning.[21] Goal theory would suggest that students who are strongly performance oriented (and thus more likely to use surface learning and memorization) are expected to perform better on multiple choice questions, whereas students who are more mastery oriented are more likely to be able to demonstrate their deeper understanding and thus perform better on essay style questions.[21, 22]

Whilst the research to-date provides us with valuable knowledge about the relationships between students' motivation and key outcome indicators of their learning, the unexplored counterpoint to the study of student achievement motivation is to examine this construct from a teacher-focused perspective. Doing so raises the following questions: (1) what do we currently know about students' preferred achievement goal orientation(s) and what can we learn from this?; (2) to what extent is student achievement goal motivation generalizable across comparable degree programs and educational settings?; and (3) to what extent are the theoretical underpinnings of achievement goal orientations predictive of success in different types of academic assessments?

There is a dearth of published research conducted in higher education settings regarding these questions. Moreover, very little is known about the achievement goal motivations of pharmacy students, their relationship to academic performance, or how they are expressed in the pharmacy education environment. To our knowledge, only two studies have been conducted to investigate pharmacy students' achievement goals. Gavaza et al,[23] found in their cross-sectional study that second year Pharm D. students adopt the P-AV goal more than first year students in the same program. In addition, Alrakaf and colleagues[24] found that adopting the P-AP goal correlated positively with academic achievement and adopting M-AV and P-AV goals correlated negatively with academic achievement for a sample of undergraduate pharmacy students at a single Australian university. To our knowledge, no studies have been undertaken to compare pharmacy students' achievement goals, across comparable degree programs, in different countries.

The current study sought to investigate these issues by conducting an international comparative study across four universities from Australia, New Zealand, Wales and England. Based on achievement goal theory and research to date, the following hypotheses were proposed:

1. In light of the performance-based learning environment characteristic of higher education settings, we hypothesized that pharmacy students' preferred

achievement goal(s) would be performance oriented rather than mastery oriented.

2. In the absence of previous research, we adopted the null-hypothesis that there will be no differences between students in comparable pharmacy degree programs (e.g. similar degree structure and language) in terms of achievement goal orientations.

3. In light of achievement goal theory we hypothesized that examination format, academic performance, and goal orientation will be related: students with high scores on MCQ examinations would be more strongly performance-approach goal oriented, and students with high scores on essay-style examinations would be more strongly mastery-approach oriented.

METHODS

Ethical approval was granted by human ethics committees at The University of Sydney (Protocol No: 14741/ 17-04-2012), University of Otago (Protocol No: D13/032), Cardiff University (Protocol No: SPPS 1213-25), The University of Nottingham (Protocol No: 14741/22-01-13).

Sample and procedures

The study was initiated in August/September of 2012. All participants were second-year undergraduate pharmacy students enrolled in the Bachelor of Pharmacy program in universities in Australia (The University of Sydney) and New Zealand (the University of Otago), or the Master of Pharmacy program in England (The University of Nottingham) and Wales (Cardiff University).

The researchers at each university invited students to participate in the study during normal lecture or tutorial periods. They were advised that participation was voluntary and, if they chose to participate, they could withdraw from the project at any time. In addition, students were advised that their decision to participate would not affect their academic results or influence their student-teacher relationships. Researchers approached the students as a group and not individually. A validated achievement goal questionnaire[24] was administered to students in paper form by the researchers. Completion of the questionnaire took approximately ten minutes. The locations for data collection were selected by the first and last authors, who contacted researchers from the countries of interest at pharmaceutical conferences. The four locations were purposively chosen, for comparability in terms of degree program structure and primary language (i.e. all universities degree programs are for a period of four years and all locations are English speaking countries).

At the end of the teaching period, students' scores from second-year units of study were collated from the four participating universities - Pharmacy Practice (PHAR2822) (Sydney), Biopharmaceutical Chemistry (PHCY256) (Otago), Clinical and Professional Pharmacy (PH2110) (Cardiff) and Professional Skills2 (B32C10) (Nottingham). Every unit of study had a final examination, but with varying formats, enabling a comparison to be made between examination type. MCQ and short essay scores, and the total mark were compiled from New Zealand and Australia. Short essay scores and the total mark were compiled from all four participating universities.

Measures

Following an international validation study,[25] in a pharmacy education setting, of two well-known and regularly used achievement goals questionnaires in undergraduate settings—the Achievement Goal Questionnaire (AGQ)[26] and the Revised Achievement Goal Questionnaire (AGQ-R)[7] - the AGQ (Appendix 1) was used to measure pharmacy students' goal orientations. The questionnaire contains 12 items intended to measure the four types of achievement goals (P-AP, P-AV, M-AP, and M-AV) on a seven-point Likert scale (ranging from 1 = "Not at all true of me" to 7 = "Very true of me"). Socio-demographic data included gender, age, and student identification number (SID). SID numbers were used only for matching students' scores with their achievement goal orientations. Individual participants could not be identified in the analysis.

To ensure participants' anonymity and confidentiality the following steps were taken:

1- All data entry was carried out by the first author who had no contact with the participants.
2- Each participant was allocated a unique identifying code which was matched to the SID; the codes/SIDs were stored in a password-protected file accessible only to the first author.
3- Once each returned survey form was received, the first author wrote the relevant code onto the survey form, then detached the page containing the SID and stored them separately from the questionnaires.
4- All analyses were based on group data and not individual data.

Analysis

SPSS 21 (SPSS Inc., Chicago, Illinois), was used for all statistical analyses. Descriptive statistics regarding gender and age are reported. One-way repeated measures ANOVA was used to compare each type of achievement goal in each university. Mauchly's test indicated that the assumption of sphericity had been violated at the Cardiff, Otago and Sydney samples, X^2 (5) = 19.37, $p < 0.05$, X^2 (5) = 16.35, $p < 0.05$, X^2 (5) = 14.80, $p < 0.05$ respectively. Therefore, degrees of freedom were corrected using Huynh-Feldt estimates of sphericity ($\varepsilon = 0.93$, $\varepsilon = 0.93$, $\varepsilon = 0.96$) for Cardiff, Otago and Sydney samples respectively.

One-way analysis of variance (ANOVA) was used for multiple comparisons of each type of achievement goal between universities. Mean scores of achievement goals were used in all analyses. All mean difference analyses were subjected to post hoc tests (Bonferroni and Tukey HSD tests).

Multiple regression procedures were performed to determine the extent to which achievement goals contributed to total, short essay and MCQ scores in each university. As gender has been found to be a predictor of achievement goal orientation and academic performance in a previous study[20], this variable was included in the model. Forced Entry Method was used to examine the odds ratios of all variables, even if not significant. A *p* value of less than 0.05 was considered significant for all analyses.

RESULTS

Demographics

A total of 486 students with a mean age of 20 years, participated in this study. Descriptive statistics for the countries' participants are reported in Table 1.

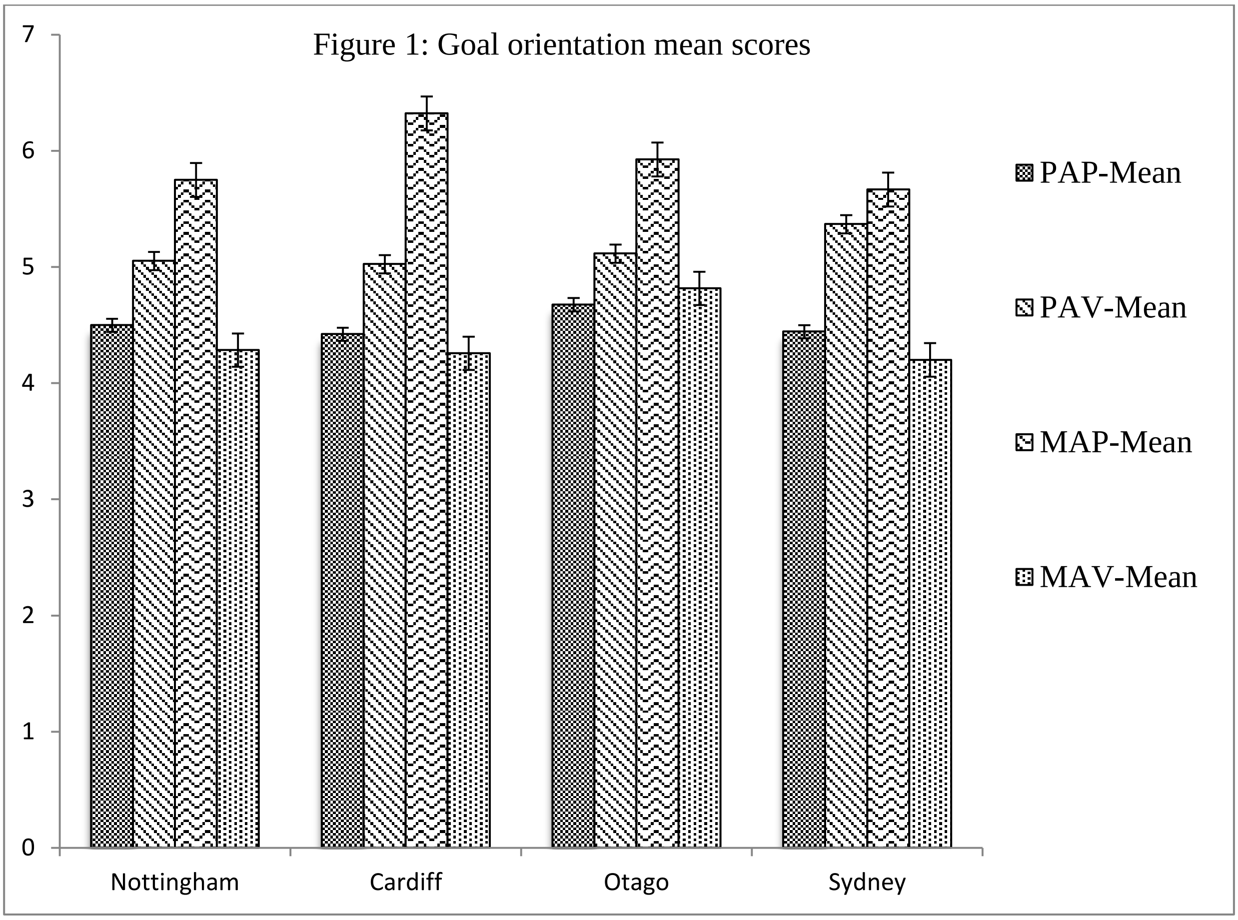
Table 1. Characteristics of all participants

Country	**Response rate**	**Age** (mean/SD)	**Gender** (female/male)	**Total** N = 486
Australia	87%	20/1.5	121 (69%) / 52 Unspecified: 1	174
New Zealand	60%	19/1.3	51 (57%) / 39	90
Wales	78%	20/1.4	65 (76%) / 21	86
England	70%	20/1.7	87 (64%) / 49	136

Contrary to expectations, hypothesis 1 was not supported; the overall preferred goal orientation across all four universities was the Mastery-Approach (M-AP) goal (Figure 1/Table 2).

A one-way repeated measures ANOVA test and post-hoc comparisons of the main effect using Bonferroni adjustment revealed that students at three of the four universities reported significantly higher scores for the M-AP goal than the other three goal orientations (Otago: $F = 17.35$, $p < 0.01$, eta2 = 0.16; Cardiff: $F = 42.47$, $p < 0.01$, eta2 = 0.34; Nottingham: $F = 37.12$, $p < 0.01$, eta2 = 0.22 respectively). At the fourth university, Sydney, a significant effect for achievement goals ($F = 56.80$, $p < 0.01$, eta2 = 0.25) and Bonferroni adjustment revealed that students in this sample reported significantly higher

M-AP goal than Performance-Approach (P-AP) and Mastery-Avoidance (M-AV) goals, but no significant difference between M-AP and Performance-Avoidance (P-AV) goals.



Regarding hypothesis 2, an overall similarity in students' goal orientations was evident in the pattern of results as displayed in Figure 1, however some *within group* variations were apparent for each goal orientation. Differences were also identified *between groups* for each of the goal orientations: One-way ANOVA results reveal statistically significant differences between groups in M-AP (F = 8.98, P = 0.000) and M-AV (F = 3.44, P = 0.017), but not P-AP and

P-AV goals. Tukey post-hoc comparisons of the four groups indicate that Cardiff students (*M* = 6.32, *SD* = 0.80) pursued the M-AP goal significantly more strongly than their peers in Sydney (*M* = 5.67, *SD* = 1.07), Otago (*M* = 5.93, *SD* = 1.04), and Nottingham (*M* = 5.75, *SD* = 0.99). Tukey post-hoc comparison also revealed that Otago students, (*M* = 4.81, *SD* = 1.40) pursued the M-AV goal significantly more strongly than other groups (Table 2).

Table 2. Universities' differences in mean scores of goal orientations

Goals	**Sydney University** ***n* = 174**	**Otago University** ***n* = 90**	**Cardiff University** ***n* = 86**	**Nottingham University** ***n* = 136**
Performance Approach	$M = 4.5^{a}$ $SD = 1.5$	$M = 4.7^{a}$ $SD = 1.5$	$M = 4.4^{a}$ $SD = 1.5$	$M = 4.5^{a}$ $SD = 1.4$
Performance Avoidance	$M = 5.4^{a}$ $SD = 1.3$	$M = 5.1^{a}$ $SD = 1.5$	$M = 5.0^{a}$ $SD = 1.5$	$M = 5.1^{a}$ $SD = 1.5$
Mastery Approach	$M = 5.67^{a}$ $SD = 1.07$	$M = 5.93^{a}$ $SD = 1.04$	$M = 6.32^{b}$ $SD = 0.80$	$M = 5.75^{a}$ $SD = 0.99$
Mastery Avoidance	$M = 4.3^{a}$ $SD = 1.5$	$M = 4.8^{b}$ $SD = 1.4$	$M = 4.3^{a}$ $SD = 1.5$	$M = 4.3^{a}$ $SD = 1.4$

Note: Means in the same row that do not share the same superscript differ significantly at $p \leq 0.05$

In order to test the third hypothesis, three multiple regression procedures were conducted to test the extent to which goal orientation (M-AP; M-AV; P-AP; P-AV) and gender contribute to the variance in students' (i) total scores; (ii) MCQ scores; and (iii) short essay scores. With respect to total scores, whilst the full model was significant ($F = 2.50$, $p = 0.03$), only gender made a contribution (Beta=0.18; t=3.31; p=0.001; CI: 1.57-6.15), indicating that females overall attained higher total scores than males.

With respect to predicting the relationship between goals and MCQ scores, the full model containing all predictors was statistically significant, $F = 4.04$, $p = 0.002$. As shown in Table 3, only two of the independent variables made a unique statistically significant contribution to the model (M-AV, and P-AV goals). The strongest predictor of MCQ was M-AV goal (beta = 0.18), $p = 0.005$. This indicated that students who strongly pursued the M-AV goal were significantly more likely to gain high scores than those who did not pursue this goal, controlling for all other factors in the model. The P-AV goal also made a significant contribution, whereby students with a strong P-AV goal orientation were likely to achieve lower MCQ scores (beta = -0.14), $p = 0.02$.

Table 3. Multiple regression predicting MCQ scores

Predictor Variables	B	t	*p*	95% C.I. for EXP(B)	
				Lower	Upper
PAP	0.05	0.84	0.39	-1.5	3.7
PAV	-0.14	-2.3	0.02*	-5.5	-0.40
MAP	0.06	0.87	0.39	-2.0	5.2
MAV	0.18	2.8	< 0.01*	1.1	6.3
Gender	-0.11	-1.8	0.07	-14	0.67

*significant contribution at P < 0.05

In predicting the relationship between goal orientations and written exams (short essay), the full model containing all predictors was statistically significant, F = 4.20, *p* = 0.001. As shown in Table 4, three of the independent variables made a unique statistically significant contribution to the model (P-AV, M-AP goals and gender). The strongest predictor of the written exam scores was P-AV goal (beta = -0.14), *p* < 0.01. This indicated that students who strongly pursued the P-AV goal were likely to gain lower scores than those who did not pursue this goal, controlling for all other factors in the model. The M-AP goal was a significant positive predictor of higher scores in the short answer essays, (beta = 0.13), *p* = 0.01, meaning that the more strongly students pursued this goal the higher their scores were. Gender also had a significant relationship with the written exam scores, (beta = 0.10), *p* = 0.03, indicating that females achieved higher scores compared to males.

Table 4. Multiple regression predicting short essay scores

Predictor Variables	B	t	*p*	95% C.I. for EXP(B)	
				Lower	Upper
PAP	0.04	0.87	0.39	-0.52	1.3
PAV	-0.14	-2.9	0.00*	-2.3	-0.44
MAP	0.13	2.6	0.01*	0.44	3.0
MAV	0.00	0.02	0.99	-0.92	0.94
Gender	0.10	2.1	0.03*	0.32	5.9

*significant contribution at $P < 0.05$

DISCUSSION

For more than three decades, achievement goal theory has been used to investigate students' learning and academic achievements across a range of disciplines, but there remains a paucity of research on student motivation in pharmacy education. This study has revealed important and useful information for pharmacy educators regarding student achievement goal motivation and provides pointers to future research. By adopting a teacher-focused lens, a number of messages can be taken from the findings of this study, which should be of assistance to pharmacy educators. Comparative studies have the benefit of enabling teaching academics to compare and contrast between different educational settings in order to borrow successful practices from each other.[27, 28]

Our aims in this international comparison study were threefold and were based on theoretical and empirical considerations. The first was to test the hypothesis that pharmacy students' preferred achievement goal orientations would be performance oriented rather than mastery oriented. The second was to examine the extent to which the goal orientations of pharmacy students are similar across comparable university pharmacy degree programs. The third was to examine the extent to which goal orientations are related to examination format in each university.

The finding that the predominant goal adopted by pharmacy students across all four universities was M-AP is unexpected. Universities by their nature base student progression on successful demonstration of competence. This demonstration is usually examination based, and the evidence to date suggests that a P-AP goal orientation is associated with higher scores[3,4,19] Furthermore, western cultures are characterized as highly individualistic, competitive and materialistic [29-31] and there is evidence that students in such cultures are inclined towards adopting the P-AP goal.[32] In addition, a previous study conducted by Smith and colleagues[33] found that second year students were more inclined towards the P-AP goal and preferred external directions from their teachers.

Whilst this finding was unexpected it was certainly pleasing. Students across all universities, regardless of subject studied or place of learning, were clearly M-AP oriented. This indicates a preference for deep learning and interest in the subject matter. Previous research indicates that M-AP develops not only competence but also confidence,[29,30] attributes which foster life-long learning. This finding should be of reassurance to teaching academics that their teaching practices encourage students to adopt productive approaches to their learning. Research evidence also suggests that students who are strongly M-AP oriented are taught by teachers who themselves adopt the M-AP goal and encourage their students to adopt this type of achievement goal.[34] Recently published research proposes that teachers who adopt the M-AP goal can inspire their students to pursue this goal as well.[35] Shim and Cassady (2013) assume that teachers who adopt the M-AP goal believe that the purpose of teaching is to facilitate students' learning and devote their efforts to create a classroom environment that enhance students' learning and mastering the task on hand. Such M-AP goals adopetd by teachers will inspire students to adopt this goal as well.[35]

The results of the second aim of our study show that there was very little difference in the *pattern* of students' goal orientations, across the university degree programs. With one exception, a pattern indicating a strong preference for the M-AP goal orientation, followed by P-AV, P-AP and finally M-AV orientations was evident. The exception was the Otago cohort indicating a stronger preference for M-AV, however this was not significantly different from the two performance goals. Of concern however is the finding that a preference for the P-AV goal amongst the student cohorts was also consistently evident, and its negative influence on performance was demonstrated in this study. As this goal orientation is the most maladaptive and unproductive of the four, teachers could explicitly focus on classroom practices which mitigate against it, such as introducing activities which foster confidence, reduce test anxiety and encourage questions. These practices could include encouraging students to ask any type of question regardless of its simplicity, ensuring students' learning tasks are incremental and achievable, encouraging team work and giving regular feedback on their performance in terms of both mastery and achievement.

Identifying the relationships between achievement goals and academic achievement also revealed interesting results. Total scores can be an imprecise indicator of the approaches students may take to their learning, and this was borne out in the results of this study. Apart from gender, there were no significant relationships between students' achievement goals and their total scores. In contrast, when a finer grained analysis is undertaken a more instructive picture emerged. Participants in our study indicating a preference for a P-AV goal orientation were more likely to achieve lower scores in both MCQ and short essay examinations. This is in line with theory, whereby the primary motivation behind the P-AV goal is avoidance.[3-5] These students, lacking confidence, strive to avoid appearing incompetent to their teachers and peers, and tend to experience test anxiety.[4] From the students' perspective they view the P-AV goal as a means of developing competence, however empirical testing of the theory shows that this approach is a recipe for attaining low scores, that is, the P-AV attributes are incompatible with acquiring and demonstrating competence. High scores in the MCQ format, on the other hand, were positively associated with the M-AV goal orientation. Like the P-AV goal, this goal orientation is characterized by 'avoidance' motivations, but in this case it manifests as striving to avoid a decline in skills or a failure to learn. It is possible that these unproductive attributes lend themselves to performance on test formats such as MCQs. As this is a novel finding further research is needed to fully understand the mechanisms behind the mastery-avoidance construct and academic achievement.

Significant positive relationships were also found between goal orientation and achievement in the short essay examination format, whereby students with a preference for the M-AP goal orientation were more likely to achieve high scores. As short essay examinations are mainly written to assess understanding, application, depth of knowledge, reasoning and problem-solving skills of the examinees[36], this finding is entirely consistent with theory and confirms our hypothesis that high scores on essay-style examinations will be strongly associated with the M-AP goal.[20] Students who adopt the mastery-approach goal demonstrate positive attributes such as deep learning, confidence and usually have a low level of test anxiety.[4]

Although MCQ exams have the benefits of providing relatively fast feedback and freedom from marking bias,[37] their disadvantages can include giving pointers to the correct answer[38] and testing memory rather than understanding.[20] Thus we posited that adoption of P-AP goal, which is associated with the use of superficial strategies such as memorization,[18] would share a significant relationship with high scores in this type of test. However our hypothesis was not supported. In fact, this achievement goal was not an orientation preferred by any of the cohorts in this study, and did not emerge as a predictor of academic achievement.

Two challenges thus present themselves to pharmacy educators: firstly, to maximize the benefits of MCQ formats without compromising learning fidelity or promoting unproductive approaches to learning; secondly to foster productive and adaptive approaches to learning whilst rewarding deep understanding with high scores.

LIMITATIONS

Not conducting a parallel qualitative study with our samples is a limitation of this study. Qualitative study could answer “why” such phenomenon occurs (for example, why the University of Otago cohort adopted the M-AV goal more strongly than any other cohorts). However, this study might open a door for qualitative studies that can clarify some of our results. Longitudinal analysis to track changes in student achievement goals as they progress through their degree would be of benefit. Low response rate from the University of Otago is another limitation to this study however, such response rate does not affect the power of statistical analysis undertaken.

FUTURE DIRECTIONS

Future research in pharmacy education could usefully focus on a deeper exploration of the impact of the M-AV goal on students' learning, their academic performance, and teacher practices. Investigating teachers' goal orientations is also warranted. Interventions testing novel teacher practices which enhance the mastery approach goal are recommended. Future research might also explore our preliminary findings that students with a preference for the M-AP goal are often taught by teachers with the same preference.[32]

CONCLUSION

Pharmacy students representing a multi-national multi-site population show a preference for the productive M-AP goal orientation more strongly than any other goal. The MCQ examination format showed clear relationships with both avoidance goal orientations, whereas the essay-style format showed clear relationships with positive and productive approach goal orientations.

To our knowledge, this is the first study to clearly differentiate between examination formats and their relationship with achievement goals. This study has demonstrated both the inadvisability of using a global measure of student academic performance, as well as the advantages of separating out overall scores into their individual components, in order to assess the motivational mechanisms behind how students learn.

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Appendix 1. Elliot and McGregor AGQ.

1	2	3	4	5	6	7
Not at all true of me						Very true of me

1- It is important for me to do better than other students.	1	2	3	4	5	6	7
2- It is important for me to do well compared to others in this class	1	2	3	4	5	6	7
3- My goal in this class is to get a better grade than most of the other students.	1	2	3	4	5	6	7
4- I worry that I may not learn all that I possibly could in this class.	1	2	3	4	5	6	7
5- Sometimes I'm afraid that I may not understand the content of this class as thoroughly as I'd like.	1	2	3	4	5	6	7
6- I am often concerned that I may not learn all that there is to learn in this class.	1	2	3	4	5	6	7
7- I want to learn as much as possible from this class.	1	2	3	4	5	6	7
8- It is important for me to understand the content of this course as thoroughly as possible.	1	2	3	4	5	6	7
9- I desire to completely master the material presented in this class.	1	2	3	4	5	6	7
10- I just want to avoid doing poorly in this class.	1	2	3	4	5	6	7
11- My goal in this class is to avoid performing poorly.	1	2	3	4	5	6	7
12- My fear of performing poorly in this class is often what motivates me.	1	2	3	4	5	6	7

Chapter 9: An Investigation of the relationship between pharmacy students' preferred teacher qualities and their achievement goal orientations

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Authors' contributions

Saleh Alrakaf conducted the study, performed the statistical analysis drafted and critically revised the manuscript. Erica Sainsbury, Grenville Rose and Lorraine Smith assisted with the statistical analysis and critically revised the manuscript.

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Ethics approval and all supporting statistics are in Appendix 6

An Investigation of the relationship between pharmacy students' preferred teacher qualities and their achievement goal orientations.

ABSTRACT

Objective: To investigate the relationships between pharmacy students' preferred 'teacher qualities' and their academic achievement goal orientations.

Methods: Participants completed an achievement goal questionnaire and a build-a-teacher task. For the latter, students were given a $ 20 hypothetical budget to purchase amounts of nine widely valued teachers' qualities. Descriptive statistics, a split-plot ANOVA design and regression analyses were conducted.

Results: 366 students participated. Students spent most on Enthusiasm, Expertise and Clear Presentation Style and least on Interactive Teaching, Reasonable Workload, Warm Personality and Intellectually Challenging. In relation to achievement goals, negative relationships were found between avoidance goals and preferences for teachers who encourage rigorous thinking and self-direction.

Conclusions: These novel findings provide a richer profile of the ways students respond to their learning environment. Understanding the relationships between teachers' characteristics and pharmacy students' achievement goal orientations will contribute to improving the quality of pharmacy learning and teaching environments.

An Investigation of the relationship between pharmacy students' preferred teacher qualities and their achievement goal orientations.

INTRODUCTION

Most faculties and schools of pharmacy seek their students' opinions regarding teaching and instructors' qualities, and it is not uncommon to find that students rate the same instructor differently. The question is why might students, for example, rate the same teacher so differently? The goals that university students adopt in class may be the answer to this question.[1] Specific types of goals that theorists believe play a major role in education are achievement goals.[2, 3]

According to achievement goal theorists, students engage in educational activities with two broad goals in mind: mastery goals or performance goals.[4-6] For either goal, gaining competence is the main aim of students[7]. However, they perceive competence in different ways. On the one hand, mastery students view competence as learning and understanding the task thoroughly, and use self-referential standards to define success versus failure.[8-10] On the other hand, performance-oriented students view competence as performing well compared to other students and they define success versus failure based on teacher-referential standards.[8, 11]

Elliot and McGregor[12] have proposed that mastery and performance goals can be further bifurcated into approach and avoidance components. A student who adopts a mastery approach goal (M-AP) aims to learn and understand the course materials as deeply as possible, whereas those who are oriented towards the mastery-avoidance goal (M-AV) aim to avoid not understanding the course materials thoroughly. Students adopting the performance-approach goal (P-AP) are motivated to outperform other students or to demonstrate their ability to either teachers or peers, whereas students adopting the performance-avoidance goal (P-AV) aim to avoid doing worse than other students or appear less talented. This distinction is supported by a large body of empirical research and is robust in predicting and understanding students' engagement and achievement.[13-15]

These goal orientations have been found to be differentially associated with a range of motivation, academic and psychological correlates. Avoidance goals have been found to be associated with negative outcomes, for example, research linking P-AV and M-AV goals to negative effects such as depression[16] and low marks in exams.[17, 18] In contrast, researchers have found that the M-AP goal has many benefits such as deep learning,[19] high individual interest,[20] high self-regulation[21], and willingness to cooperate.[22] Yet, to the achievement theorists surprise, the M-AP goal rarely can predict high academic achievement (i.e. grade marks).[13] The P-AP goal, however, is linked to different outcomes. It is associated with "surface" learning approaches such as memorization,[23] but also with high marks in exams.[24, 25]

In an attempt to find an explanation to the unexpected relationship between the 'approach' types of achievement goals and academic achievement, Senko and his colleagues[11] hypothesized that each type of achievement goals affects students' learning strategies differently. According to the authors, students who adopt M-AP goal tend to study materials that appear interesting to them regardless of their importance or testability, while P-AP oriented students do not. Those students, instead of following their own interest, will study what might appear on the examination paper and try to figure out what is important to their teachers. As a result, they gain high marks compared to their M-AP peers.[26]

The quality of higher education is dependent in large part upon the qualities of teachers who teach in this sector.[27] Determining which qualities are considered essential and effective can be difficult to define as every stakeholder in the higher education system (e.g. students, teachers, administrators and scholars) has his/her own view and opinion about essential qualities that teachers in higher education should acquire.[28] However, all of them believe that teachers' qualities do have a great impact not only on students' education but their future life as well.[29] An area that teachers' qualities play a major role in, is students' achievement goals (for a review see Murayama and Elliot,[30] Walters and Daugherty[31]). A recent study conducted by Shim and her colleagues[32] found that teachers who strongly pursue mastery goals can foster the adoption of these goals by their students, while teachers who strongly pursue performance goals foster the adoption of same goals by their students. Although such impacts are well documented, little is known about how students' achievement goals might influence their preferences for teachers' qualities.[33]

According to Senko and his colleagues[33], M-AP and P-AP goals adopted by students do affect the qualities and traits that students would like to see in their teachers as well.[33] The authors finding that students who adopt a M-AP goal value the most teachers who challenge them Intellectually and have a wide experience in their topics, while students who adopt a P-AP goal value teachers who provide suggestions about how to gain high marks on exams and teachers who present their material clearly. Valuing these qualities by both types of students does not suggest that these students do not like other qualities such as warmth and enthusiasm. It simply means that students consider the latter qualities as less important and not a necessity.[33] These so-called 'luxury' qualities are desirable yet only after obtaining the essential and necessary ones.[33] Senko et al so far tested the effect of approach types of both mastery and performance goals. However, in order to have a deeper appreciation regarding the four types of achievement goals we believe that investigating the impact of avoidance types of achievement goals and their relationship to teachers' qualities is important; given that avoidance types of achievement goals are maladaptive and unproductive, knowing the qualities of teachers that are preferred by students who strongly adopt either type of avoidance goals is beneficial if we want to review our teaching methods which might foster the adoption of these goals.

Thus our study has three aims. Firstly, to investigate which qualities pharmacy students prefer the most in their teachers. Secondly, to test, in a pharmacy education setting, assumptions regarding how M-AP and P-AP goals affect students' preferences about teachers' qualities, and thirdly, to investigate the effects of the avoidance type of achievement goals (i.e. M-AV and P-AV) upon teacher qualities. To our knowledge, no study has assessed the effects of the four types of achievement goals upon students' preferences of teachers' qualities. This study will provide us with valuable information about the effects of each type of achievement goal on students' preferences for teaching and teachers' qualities.

METHODS

Conduct of this study was approved by the Human Research Ethics Committee, The University of Sydney (Protocol No: 2012/820 on 28-06-2013), NSW, Australia.

Sample

The participants for this study were Second and Fourth year undergraduate pharmacy students enrolled in a Bachelor degree program at the Faculty of Pharmacy, The University of Sydney, Australia. The program is a 4-year program that enables graduates to register as a pharmacist in Australia.[34]

Measures

The survey comprised two measures: The Achievement Goal Questionnaire[12] (AGQ) and build-a-teacher task.[33] In addition to these measures socio-demographic indicators included in the survey were gender and age.

The AGQ is a validated and psychometrically robust instrument[35] intended to measure the four types of students' achievement goals. The questionnaire contains 12 items. Students rated each goal item on a 1(1= Not at all true of me) to 7 (Very true of me) scale.

The build-a-teacher task[33] is a list of 9 widely valued teachers' qualities. This list is a validated and commonly used instrument for measuring teachers' qualities.[33] The task was a ‘budget’ based task requiring students to design their “ideal” teacher by buying teachers’ qualities with a limited budget. The purchasing scale ranges from A$0 to A$10. This method encourages students to carefully consider their choices as the more they spend in one quality the less money is left to spend on other qualities.[33 36]

The budget limitation method is preferred over Likert scale measures as the latter deal with each quality separately without considering the qualities’ priorities.[33] Likewise, this method is preferred over ordinal scale measures as distinguishing between necessity and non-essential (‘luxury’) qualities can be unreliable and open to variations in interpretation.[33] For example, it is hard to know if 4th and ranked 5th qualities are either necessities or luxuries or if one of them is a necessity and another is a luxury.

Procedures

The study was initiated in the first semester of the academic year 2013. Students were invited to participate in the study during normal lectures or tutorials. They were advised that participation was voluntary and if they chose to participate they could withdraw from the study at any time. In addition, students were advised that their decision to participate would not impact on their academic performance results or influence student-teacher relationships. Researchers approached students as a group and not individually. The survey was administered by the first author.

Students completed the survey in paper form. For the build-a-teacher task, students were given a hypothetical A$20 budget to purchase the 9 teachers’ qualities. In the written instructions students were told that the maximum amount of money they can spend on one quality is A$10. Students were asked to spend their full budget in a way that reflects their preferences. Completing the task took approximately 20 minutes.

Analysis

SPSS 21 (SPSS Inc, Chicago, Illinois) was used for all statistical analyses. Descriptive statistics regarding gender and age are reported. A split-plot ANOVA design (SPANOVA), with academic year as the between-subjects factor and teachers' qualities as the within-subjects factor was used to investigate the impact of academic year upon students' preferences for teachers' qualities and to compare students' responses to the 9 different teachers' qualities.[37] Where the sphericity assumption was violated, the Huynh-Feldt degrees of freedom were reported. Bonferroni correction was performed in SPSS 21. A multiple regression analysis procedure was performed to assess the effect of each achievement goal type on students' spending upon teachers' qualities.

RESULTS

366 students (235 female, 128 male and 3 who did not reveal their gender), with a mean age of 21.3 years (standard deviation = 2.67), participated in this study. The survey yielded a response rate of 73.20%

Did students prefer some teachers' qualities over others?

Mauchly's test indicated that the assumption of sphericity had been violated, $p < 0.05$, and therefore, degrees of freedom were corrected using Huynh-Feldt estimates of sphericity. A split-plot ANOVA design (SPANOVA) test revealed no significant impact of academic year on students' preferences for teachers' qualities, $p = 0.66$. However, there was a substantial main effect for teachers' qualities (i.e. there are significant differences between teachers' qualities that students prefer). The test showed that students did prioritize some qualities over others, $p < 0.01$. Students' most preferred quality was Enthusiasm/ Entertaining ($M = 3.09$, $SD = 2.15$), followed closely by Topic Expertise, Clear Presentation Style, and Clarity About How To Succeed. They considered Reasonable Workload (M = 1.61, SD = 1.64) and Interactive Teaching Style (M = 1.57, SD = 1.51) the least essential (Table 1). The main effect comparing the two academic years was not significant, $p = 0.23$, suggesting no difference between the two academic years. Bonferroni pairwise comparisons were performed and the variables were placed in groups where there were no significant differences. No significant differences were found among Enthusiastic, Topic Expertise and Clear Presentation Style qualities. However, these latter qualities were significantly differing from other teachers' qualities such as Good Feedback, Intellectually challenging, Warm/Compassionate Personality, Reasonable Workload and Interactive Teaching Style.

Table 1. Total means and standard deviations of teachers' qualities

Teachers' qualities	**Mean/(SD)**
Enthusiastic/Entertaining	3.09[a]/ (2.15)
Topic Expertise	3.08[a]/ (2.02)
Clear Presentation Style	2.84[ab]/ (2.15)
Clear About How To Succeed	2.43[b]/ (1.99)
Good Feedback	1.88[c]/ (1.73)
Intellectually Challenging	1.81[c]/ (1.65)
Warm/Compassionate Personality	1.69[c]/ (1.65)
Reasonable Workload	1.61[c]/ (1.64)
Interactive Teaching Style	1.57[c]/ (1.51)

Note: Qualities that do not share the same subscript are significantly different using Bonferroni correction.

Relationships between pharmacy students' preferred teacher qualities and their achievement goal orientations

A standard multiple regression was performed to assess the impact of the different types of achievement goals on the 9 teachers' qualities. The model contained four independent variables (P-AP, M-AV, M-AP and P-AV goals). The relationships between students' achievement goals and their preferred teachers' qualities are determined by any significant relationship between a goal and the money spent on a teacher quality.

As shown in Table 2, the more students pursued mastery avoidance goals, the less they spent on the Enthusiastic teacher quality (p = 0.03).

Furthermore, the more students pursued performance avoidance goals the less they would like to see their teacher challenging them Intellectually (p = 0.01). In addition, our results showed that, the more students pursued performance approach goals, the less they spend on a teacher who has a Warm/Compassionate Personality (p = 0.01).

Table 2. Regression analyses of goal relationships with spending towards each instructor quality

Teachers' qualities	**M-AP** ***P***	**M-AV** ***P***	**P-AP** ***P***	**P-AV** ***P***
Enthusiastic/Entertaining	0.16	**0.03**	0.14	0.06
Intellectually Challenging	0.46	0.28	0.76	**0.01**
Topic Expertise	0.06	0.96	0.27	0.53
Clear About How To Succeed	0.76	0.76	0.09	0.06
Clear Presentation Style	0.07	0.39	0.96	0.63
Reasonable Workload	0.19	0.05	0.76	0.08
Interactive Teaching Style	0.37	0.18	0.83	0.20
Warm/Compassionate Personality	0.73	0.36	**0.01**	0.98
Good Feedback	0.21	0.71	0.18	0.53

The model is statistically significant at $p < 0.05$

DISCUSSION

This study tries to answer three important questions. One is what are the teachers' qualities that students prefer most? (our first aim). Second question is to what extent do approach goals (M-AP and P-AP) influence students' preferences for teachers' qualities (our second aim). The third question is to what extent do avoidance goals (i.e. MAV and P-AV) influence students preferences for teachers' qualities (our third aim). In an attempt to answer these questions in a precise manner, we used a budget methodology which is specifically designed to differentiate between essential and non-essential teacher qualities,[33] and a validated measure of achievement motivation.[35]

That the Enthusiastic quality emerged as one of the most preferred teachers' qualities was not a surprise to us. A qualitative study conducted by Alrakaf et al[38] to investigate undergraduate pharmacy students' preferences for teaching, indicated, without prompting, that this quality was highly valued by students. However, an interesting finding was the bottom ranking of Interactive Teaching Style. This type of teaching style is viewed by many scholars as highly valued by students as well as being beneficial in terms of academic achievements.[39-41]

A closer look at the preference students had for their teacher qualities reveals that on the whole, the highly valued qualities were those that reflected teacher engagement with the learning process, where the emphasis is on the level of teacher commitment to the task of optimizing students' learning and achievement. The least valued qualities, on the other hand, were those that reflected student engagement with the learning process, where the emphasis is on students’ commitment to optimizing their own learning and achievement. Take for example, the Intellectually Challenging teachers' quality. This quality requires students’ commitment towards learning and an ability to perform self-directed learning tasks. These results are supported by the findings of our previous work regarding our pharmacy students’ approaches to learning, whereby our students were found to be dependent upon and value external sources of support and find self-directed learning approaches challenging. Our previous research[34, 42] has shown both cross-sectionally and longitudinally that pharmacy students prefer to learn through dependence on teacher-sourced strategies rather than self-sourced strategies, and that deep processing and critical thinking are not routinely favored by students.

The low ranking that Interactive Teaching Style received may also be due to the introduction of the online recorded lecture system that enables academics to record lectures and make it available to students electronically. Although all other pharmacy classes (workshops, tutorials and laboratories) are face to face, by using such a system no attendance at lectures is required. Thus, students may feel that having a teacher with an Interactive Teaching Style is not as essential as in the past. Using internet sites such as YouTube as a source for information may also explain why students consider an Interactive Teaching Style as the least essential quality that they would like to see in their teachers. The use of internet technology is a defining feature of this generation of students; they are the first generation to have had the internet as a part of their lives from birth.[43, 44]

Whilst our findings in relation to our first aim support those that Senko and his colleagues[33] found in their study, in answering the second question, our results are quite different. In contrast to Senko et al's[33] results, the only significant relationship we found was a negative relationship between P-AP goals and Warm Personality. Our results indicated that students who more strongly pursue P-AP goals have less preference for a Warm and Compassionate teacher. This result might be attributed to the competitive nature of P-AP oriented students who tend to affirm their competence by outperforming their peers. There is evidence to suggest that Warm and Compassionate teachers may be willing to take into account the circumstances of struggling students and give preferential treatment with respect to grades [45].

Our study has extended previous research[33] by examining the impact of avoidance goals (i.e. M-AV and P-AV). Our results show that both avoidance goals have significant negative relationships with the Enthusiastic and Intellectually Challenging teacher qualities respectively. This indicates that the more strongly students adopt M-AV or P-AV goals the less necessary it is that their teacher is enthusiastic or challenging them intellectually. These findings may be attributed to the specific motivational attributes of students who adopt these avoidance types of goals. Fears of facing shame, embarrassment and being criticized by teachers are highly linked to students who pursue these goals.[46] As the aim of students who adopt M-AV goal is to avoid not understanding the course materials thoroughly, a teacher who uses humor and anecdotes might be seen as a distractor to their serious effort of making sure they understand everything. Also, an Intellectually Challenging teacher may inadvertently create an intimidating environment for students who pursue a P-AV goal as they tend to be afraid of being criticized and appearing untalented in front of both teacher and students. Furthermore, students who adopt either types of avoidance goals perceive challenging activities as a threat to their self-esteem.[47]

LIMITATIONS

Using a pharmacy cohort from one institution is a limitation for this study. However, the Faculty of Pharmacy is the only faculty in Sydney, Australia that offers a Bachelor degree in Pharmacy. In order to generalize these results, a national study of Australian pharmacy students would be preferred, as well as a multi-national study using pharmacy students. The strengths of the study are that two validated measuring instruments were used, and a unique and engaging method of tapping students' preferences for their teacher quality was employed"

CONCLUSION

Pharmacy students value a range of teacher qualities that are stimulating and promote achievement rather than deep thinking. Their engagement with their learning is characterized by a preference for teacher-focused strategies rather than self-focused strategies. In keeping with this approach to learning, students who adopt avoidance-type achievement goals value least of all those teacher qualities that promote self-directed learning. These findings highlight the nexus between teaching and learning. They can be used to inform the development of learning, teaching and assessment strategies that optimize topic mastery, critical thinking and academic achievement.

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Chapter 10: Discussion and Conclusion

10.1 Rationale for this research

The development of this project was based on existing literature as well as empirical studies designed to explore undergraduate pharmacy students' achievement goals and their relationship to academic achievement, ethnicity, and assessment types. In addition, this thesis investigated the influence of the type of achievement goals adopted on the qualities that students would like to see in their teachers. Furthermore, this dissertation explores and compares the predominant type of achievement goals that are adopted by pharmacy students in some other English-speaking countries.

Achievement goal theory and its implications have proved to be significant in the field of education. Over the past three decades, more than 1,000 scholarly articles and dissertations have been written regarding this theory, not only in education, but also in other fields, such as sports and business (Hulleman et al., 2010). However, despite its wide use and applicability, particularly in education, very little is known regarding the role of achievement goals in undergraduate pharmacy education settings (Alrakaf et al., In Press-b). For example, to the best of the researcher's knowledge, no research has been conducted to identify undergraduate pharmacy students' achievement goals in Australia, New Zealand, or the UK. The only two studies that used achievement goal theory as a framework (Gavaza et al. 2014; Waskiewicz 2012) are from the USA, and the cohorts investigated were PharmD students who had already completed their higher education studies. This dissertation fills this gap in the literature by exploring and identifying undergraduate pharmacy students' achievement goals. Specifically, this project answered the following questions in relation to the pharmacy education setting:

1. What are students' preferences for teaching and learning, and what are the views of their teachers regarding student learning attributes and their own preferences for teaching and assessing their students?
2. What is the best instrument that can be used to identify pharmacy students' achievement goals?
3. What are students' preferred achievement goals and is there a predominant goal type?
4. What are the relationships between the achievement goals that students adopt and both academic achievement and ethnicity?
5. Do students' achievement goal orientations change over time?
6. What is the predominant type of achievement goal that is adopted by other English-speaking pharmacy students compared to that of Australian students?
7. What are the relationships between achievement goals and the different types of assessment formats?
8. Do the various types of achievement goals adopted influence student preferences regarding the qualities they would like to see in their teachers?

10.2 Strengths of the research design

This project has a number of strengths which include:

- Previous research studies conducted in the educational field have mainly studied undergraduate students' achievement goals in different disciplines, such as psychology, business, biology, art, English, history, mathematics, and nursing (Lieberman and Remedios, 2007; Elliot and Murayama, 2008; Harackiewicz et al., 2008). This is the first study to identify undergraduate pharmacy students' achievement goals and their relationship to academic achievement and thus the first to offer evidence-based insights into pharmacy students' motivational approaches to their learning.
- This research emphasizes the importance of validating measures of student motivation and their impact upon future studies in the pharmacy education field. In addition, it highlights the importance of validating a questionnaire prior to using it in a different discipline.
- In contrast to much of the published literature (e.g., see Elliot et al., 2001; Kao, 1995; Witkow and Fuligni, 2007), which has grouped students from different Asian backgrounds under one label (i.e. Asian) and applied their findings to the whole group, this research clearly revealed that individual Asian ethnicities varied in their adoption of achievement goals. The study presented in Chapter 6 is the first to analyse each Asian ethnicity separately, and this separation has yielded significant conclusions.

- Another strength is that this is the first study to differentiate between different types of written examinations and the relationship between type of examination and achievement goals. This is in contrast to previous studies (e.g., see Cury et al., 2006; Elliot and McGregor, 2001; Elliot et al., 1999; Elliot and Murayama, 2008; Harackiewicz et al., 2000; Harackiewicz et al., 2002b; Harackiewicz et al., 2008), which employed an undifferentiated methodology and thus were unable to discriminate between the influence of achievement goals on examination type.
- This project is the first to assess the changes in undergraduate pharmacy students' achievement goal orientations over time.
- This project is the first to have investigated the effects of the adoption of all achievement goal types (i.e., performance-approach, performance-avoidance, mastery-approach and mastery-avoidance) on students' preferences for the qualities that they would like to see in their teachers. Previous work in this area has focused on the effects of the approach type of achievement goal (i.e., performance-approach and mastery-approach) only.
- A final strength of this thesis is that it is the first study to examine achievement goal motivation across a range of pharmacy education settings from different countries. No other study that the researcher is aware of has done this previously.

10.3 Key findings

This section will discuss the key findings of this research in five areas: 1) Australian undergraduate pharmacy students' and academics' views of, and preferences for, learning and teaching; 2) the international validation of the Achievement Goal Questionnaire and the Revised Achievement Goal Questionnaire; 3) identifying Australian undergraduate pharmacy students' achievement goals and their relationship with both academic achievement and ethnicity; 4) identifying the predominant achievement goal and the relationship between achievement goals and examination types in multiple English-speaking countries and 5) the relationship between Australian pharmacy students' preferred teacher qualities and their achievement goals.

Pharmacy students' and academics' views of, and preferences for, learning and teaching

Qualitative interviews with both pharmacy students and their teachers were conducted. The aim of the study was to investigate first-year undergraduate pharmacy students' preferences regarding their pharmacy teaching and learning environment, and to investigate pharmacy teaching academics' views regarding both their first-year undergraduate pharmacy students' learning attributes and their preferred methods of teaching and assessment. Four key themes emerged regarding students' preferences: teacher characteristics (enthusiasm), communication (face-to-face), transition to tertiary environment (independence-learning), and study strategies (YouTube). Analysis of the interviews with academics revealed two key themes: student characteristics (independent-learning) and communication (face-to-face).

The students' views about "boring" teachers and "dry" lectures are aligned with previous research suggesting that these qualities may act as demotivators (Atkinson, 2000; Wentzel and Battle, 2001). Linking positive motivational qualities to what makes a "good" teacher suggests that a teacher's motivation and interest can act as a source of motivation and interest for their students. Furthermore, the academics acknowledged these qualities when asked for their suggestions for how to increase student engagement.

An obvious disagreement between students and their teachers concerned independent learning. While teachers clearly valued this quality and saw it as key to successful learning, students viewed this quality as challenging and difficult to attain, especially with the sheer volume of the material covered in their classes, and the pace at which it was covered.

This contrast between the students' and teachers' views with respect to independent learning was understandable, especially in first-year students, who had mostly arrived at university directly from high schools that had not prepared them for independent learning. These results also support previous pharmacy research showing that undergraduate pharmacy students were not inclined to independent learning (Smith et al. 2007).

The use of online and internet technology by students and academics was viewed as beneficial for both, whether it be for allowing students to study at home, or for improving lecture behaviour. The students' assertion that using YouTube was the best way to understand a difficult subject was an interesting finding. Although there are a myriad of educational materials on YouTube, the accuracy of such materials is questionable (Jones and Cuthrell, 2011). In addition, the material is not guaranteed to be present on the internet all the time (Cha et al., 2007). Despite these downsides, it is unlikely that students will stop using this medium if they face a difficult concept or subject.

The international validation of the Achievement Goal Questionnaire and the Revised Achievement Goal Questionnaire

This study comprised a validation of two widely used instruments, the Achievement Goal Questionnaire and the Revised Achievement Goal Questionnaire (Elliot and McGregor, 2001; Elliot and Murayama, 2008), both of which are used for measuring students' achievement goals. The purpose was to select the instrument that would be most valid for use in future identifying undergraduate pharmacy students' achievement goals. The questionnaires were validated for use with undergraduate pharmacy students from Australia as well as other English-speaking countries. Participants totalled 876 students from Australia, New Zealand, England, Wales, and the United States. Confirmatory factor analysis supported a superior model fit for the Achievement Goal Questionnaire compared to the Achievement Goal-Revised Questionnaire.

The observation that the Achievement Goal Questionnaire showed greater validity in pharmacy education settings than the revised questionnaire was an interesting and crucial finding. It is interesting, as this finding is in contrast to the creators' claims that the revised questionnaire is more psychometrically sound than the original. It is a crucial finding, as the researcher was able to use the most psychometrically robust instrument for this project.

In contrast to Elliot and Murayama’s (2008) findings, this study shows the Achievement Goal Questionnaire to be a more robust measure of pharmacy students’ achievement goal orientations than the Revised Achievement Goal Questionnaire across all studied sites. The factor loadings, correlations and fit indices all indicate that the Achievement Goal Questionnaire is more psychometrically sound than the Revised Achievement Goal Questionnaire in all the tested pharmacy student cohorts.

Identifying undergraduate pharmacy students’ achievement goals and their relation to both academic achievement and ethnicity

The aim of this study was to identify and compare the achievement goals of first- and third-year undergraduate pharmacy students and their relationships to both academic achievement and ethnicity. The study was conducted in the Faculty of Pharmacy at the University of Sydney, Australia. In total, 380 students agreed to participate in the study. The Achievement Goal Questionnaire was used to measure students’ achievement goals.

This study showed that first-year students adopted mastery-approach goals to a greater extent than third-year students. Although this result was consistent with those of Lieberman and Remedios (2007) and Remedios et al. (2008), our study differed from theirs in terms of performance-approach goal. While Lieberman and Remedios (2007) found that third-year students adopted performance-approach goals more strongly than first-year students, and Remedios et al. (2008) found no significant differences between first, second, third and fourth year students’ adoption of performance-approach goals, the current study revealed that first-year undergraduate pharmacy students did adopt the Performance-Approach goal more than third-year students. Such greater adoption of performance-approach goal might be attributed to the residual influence of the competitive environment that Australian first-year students were accustomed to in their high schools.

Finding a significant positive correlation between adopting the Performance-Approach goal and high academic achievement was consistent with several previous studies (Barron & Harackiewicz, 2003; Cury et al. 2006; Harackiewicz et al. 2002; Hulleman et al. 2010; Hulleman & Senko 2010; Murayama & Elliot 2012). This finding might be due to the vigilance that performance-approach oriented students adopted in order to know about the important topics that might appear in their exams (Alrakaf et al., In Press-b; Senko and Miles, 2008). This is in contrast to the mastery-approach oriented students who follow their own interests and study what they view as interesting topics regardless of their importance to their teacher (Senko and Miller, 2008).

In relation to ethnicity and achievement goals, this study was the first, to the researcher's knowledge, to differentiate between different Asian ethnicities. The study found that students from Chinese backgrounds adopt the performance-approach goal more strongly than Anglo students. This result might be attributed to the high expectation of Chinese parents for high academic performance by their children during their studies (Li, 2001). These findings are in contrast to Zusho et al.'s (2005) study, which did not reveal any significant difference in adopting this type of achievement goal between Asian and Anglo-American students, possibly due to the fact that the researchers did not differentiate between Asian ethnic groups.

This study also showed that the Mastery-Avoidance goal was more strongly adopted by students from Vietnamese backgrounds than their Anglo peers. This result was consistent, to some extent, with studies that found Asian students are more prone to adopt avoidance goals (Elliot et al. 2001; Lee et al. 2000; Witkow & Fuligni 2007).

<u>Identifying the predominant achievement goal and the relationship between achievement goals and examination types in multiple English-speaking countries</u>

This study identified the predominant types of achievement goal in multi-national undergraduate pharmacy student settings, and compared the achievement goals of these samples with each other. In addition, the study identified the relationships between achievement goals and different types of academic assessment. A total of 486 undergraduate pharmacy students from four countries (Australia, New Zealand, Wales, and England) participated in this study. The findings of this study revealed interesting results.

The study found that the mastery-approach goal is the predominant type of achievement goal adopted by pharmacy students across all these universities. This result was not expected as it could be argued that universities by their nature set exams as barriers to progression, thus, encouraging students to adopt the performance-approach goal (Hulleman et al. 2010). In addition, a previous study conducted by Smith et al (2007) found that second year students were more inclined towards the P-AP goal. However, it is noteworthy to emphasise that the smith et al (2007) study was conducted when the previous curriculum was in place. Since then, the curriculum has been revised. It is possible that the unexpected finding of a preference for the M-AP goal reflects this. Neverth eless, the finding that undergraduate pharmacy students show a preference for the mastery-approach goal is certainly pleasing. Such adoption indicates that students participating in this study are inclined toward deep learning and have an interest in their subjects. In addition, previous studies showed significant positive correlations between adopting mastery-approach goals and both confidence and competence (Elliot et al. 2001; Remedios et al. 2008). As there is research evidence suggesting that teachers who adopt mastery-approach goals do foster the adoption of this goal by their students (Kaplan et al., 2002; Shim et al., 2013), this result suggests that teachers at these pharmacy faculties and schools may adopt mastery-approach goals themselves and their pedagogic practices are able to encourage students to adopt the mastery-approach goal.

In regard to the relationships between achievement goals and academic achievement, this study demonstrated the importance of fine-grained analysis of examination types. First, total marks can be a misleading indicator of the approaches students take to their learning; the study found no significant relationships between any types of adopted achievement goals and total marks. Second, when total marks were bifurcated into multiple choice question marks and short essay marks, a clearer picture emerged. The finding that students who adopt the performance-avoidance goal attain low marks in both multiple choice questions and short essay exams is consistent with the achievement goal theory that links this type of achievement goals to low academic achievement.

The study found that students who strongly adopt the mastery-approach goal were more likely to achieve higher marks in the short essay exams. As short essay exams are mainly designed to assess students understanding and application of knowledge (Dathe et al. 1991), this result is consistent with the achievement goal theory and confirms the hypothesis that the high marks of this format of examination are more likely to be gained by mastery-approach oriented students (Biggs & Tang 2007).

<u>Do achievement goals change over time?</u>

The aim of this study was to examine the changes that may occur in undergraduate pharmacy students' achievement goals over time. To achieve this aim, two cohorts of students were followed over one academic year; Cohort I, from year 1 to year 2 and cohort II, from year 3 to year 4. In total, 193 students participated in this study. The Achievement Goal Questionnaire was used to measure pharmacy students' goal orientations twice during this period. The first time was in semester two of 2012 and the second time was in semester two of 2013.

Regarding Cohort I, the study found that there was a significant decrease in the performance-approach goals' scores from year 1 to year 2. The earlier cross-sectional study (Chapter 5) revealed that first year students had a stronger preference for the performance approach goal orientation than their third year counterparts (Alrakaf et al., In Press-b). It was proposed that the reason for this might be explained by the decreasing influence of the competitive environment that students were accustomed to in high school (Alrakaf et al., In Press-b). The longitudinal results thus may be indicating that this focus by the students on out-performing their peers may have declined by the end of second year at university. In addition, the Cohort I result revealed that students' mastery-avoidance scores were significantly decreased from year 1 to year 2 whilst mastery-approach scores remained steady.

The study found that in Cohort II, students' performance-avoidance goal scores significantly decreased from year 3 to year 4. Such decrease is a reassuring finding given the negative outcomes associated with this goal such as anxiety and poor academic performance (Hulleman et al., 2010; Murayama & Elliot, 2012).

However, the interesting finding was the sustainability of the mastery-approach goal over time in both cohorts. Such stability might be a result of the Faculty's teachers' achievement goals. Evidence indicates that teachers who strongly adopt the mastery-approach goal might be able to help their students to adopt the same goal in their students (Kaplan et al., 2002; Shim et al., 2013). This stability may also be a characteristic of the achievement motivation construct; goal stability is a related field of research (Fryer and Elliot, 2007; Senko and Harackiewicz, 2005) which proposes that achievement goal orientations are a product of personality traits and can be sustained through stable classroom environments and skilled teachers (Fryer and Elliot, 2007).

The relationship between pharmacy students' preferred teacher qualities and their achievement goals

This study aimed to investigate the qualities that undergraduate pharmacy students valued the most in their teachers and explored the relationship between students' adopted achievement goals and their preferred teacher qualities. In total, 366 students participated in this study. In addition to completing of the Achievement Goal Questionnaire, students completed a build-a-teacher task instrument in which they were given a hypothetical budget of $20 to purchase amounts of nine widely valued teacher qualities.

This study showed that "enthusiasm" was one of the most strongly preferred qualities that undergraduate pharmacy students would like their teachers to have. This result was aligned then Alrakaf et al. (2014) qualitative study which found that students highly valued this quality in their teachers.

The finding that "interactive teaching style" was ranked the lowest was an interesting finding as many scholars argue that this quality is highly valued by students and has beneficial academic outcomes (Costa et al., 2007; Knight and Wood, 2005; Reynolds and Farrell, 1996). This result may be due in part to the introduction of the online recording system that enables teachers to record and post their lectures online. Thus, attendance at lectures is not required. As a result, students might not appreciate such a quality in their teachers. Using YouTube as a source for information and knowledge (Alrakaf et al., 2014) by many students might also explain this finding.

The study revealed that in general, the teachers' qualities that students preferred the most reflected teacher engagement with the learning process, where the emphasis is on the level of the teachers' commitment to deliver the knowledge and help students find the easiest path to success. However, the least valued qualities were those qualities that reflected the students' engagement with the learning process. The low-ranked "intellectually challenging" teacher quality, for example, requires students' commitment to learn independently. These results are supported by other studies investigating pharmacy students' approaches to learning which revealed that students value external sources of support and find independent learning challenging (Alrakaf et al., 2014; Smith et al., 2007). For example, the researcher and his colleagues (Alrakaf et al., 2014) found that students were not inclined toward independent learning and prefer teachers who provide them with step-by-step guidance.

In investigating the relationship between achievement goals and preferred teacher qualities, the study found, in contrast to the original research conducted by Senko and his colleagues (2012), the only significant relationship was a negative one between performance-approach goals and a "warm personality". This result may be due to the competitive nature of performance-approach-oriented students who only view success as a process of outperforming their peers. Thus, teachers possessing such a quality might be viewed by these students as persons who are willing to take into account the circumstances of struggling students and offer them academic help (Crocker et al., 2009).

In contrast to the Senko et al. (2012) study which examined only the effects of approach types of achievement goals on preferred teacher qualities, this study also explored the impact of avoidance goals. The findings show that mastery and performance avoidance goals have significant negative relationships with the “enthusiastic” and “intellectually challenging” teacher qualities, respectively. These results may be due to the fear of facing shame, embarrassment and being criticized by teachers which are strongly linked to students who adopted avoidance goals (Conroy and Elliot, 2004). Teachers who use humour and anecdotes in their teaching might be seen as distracting to those students who adopt the mastery-avoidance goal as these students put high levels of effort to avoid not understanding course materials thoroughly. As students who adopt the performance-avoidance goal tend to avoid being criticized by their teacher, an intellectually challenging teacher may unintentionally create an intimidating environment for such students.

10.4 Implications and recommendations for pedagogical practice

Pharmacy education is changing rapidly, and students attending pharmacy schools these days are different from students who attended the same schools even one decade ago. The results of this research project highlight the contrasting views between students and teachers regarding the independent learning. While students view this quality as challenging and hard to attain, teachers obviously valued it. In order to address this issue, teachers’ expectations, particularly for first-year pharmacy students, could be adjusted to a more realistic level and their learning materials could include more scaffolding to support the development of skills in independent learning (Abraham et al., 2011; Du, 2012). In addition, adopting problem-based learning as a method of teaching has been found to foster students' transition from dependent to independent learning (Guner et al., 2011; Tonts, 2011; Winning et al., 2004). Furthermore, students' expectations need to be addressed as well. Students should appreciate the benefits of independent learning not only during their college years but also the long-term benefits of such a quality after their graduation. To help students appreciate such a benefit, teachers may emphasize the importance of independent learning not only for them as students but also as future pharmacists.

The importance of technology, such as YouTube, for pharmacy students and how they use this technology to help them understand difficult topics has emerged from this research. Knowing this, and knowing that it is almost impossible to divert students from YouTube, despite the risks of using unreliable educational clips, academics could take the initiative and recommend some reliable and evidence-based clips for their students on YouTube.

This project has also demonstrated the importance of conducting studies to confirm the reliability and validity of psychometric measures of achievement motivation, particularly when these measures have been validated in other cultures or educational domains. As a result of the psychometric validation study, Alrakaf and colleagues had an evidence basis from which to express concerns (Appendix 8) regarding potentially inappropriate use of the AGQ

(Elliot and McGregor, 2001) and AGQ-R (Elliot and Murayama, 2008) in a recently published study (Gavaza et al., 2014).

The findings of this research suggest that by knowing our students' achievement goals and their relationships with different aspects of higher education, such as academic achievement, academic year, ethnicity, and examination types, academics in different pharmacy schools could modify their teaching styles to encourage the approach type of achievement goals (performance-approach and mastery-approach) and discourage the avoidance-type goals (performance-avoidance and mastery-avoidance) (Shim et al., 2013). Curriculum and syllabus development which draws on achievement motivation theory and the evidence gained from studies such as this one will enable academic teaching staff to foster these productive approaches to learning and teaching.

Nowadays, it is not uncommon to find students enrolled in a pharmacy course from a number of different religious, cultural or ethnic backgrounds. Alrakaf et al (In Press-b), found that a research design incorporating variables which differentiate between these types of factors has the potential to show the unique contribution such group membership can have to goal orientation and subsequent academic performance. Although there has been, over the years, anecdotal evidence suggesting these trends, this research has provided the first evidence base in pharmacy education that supports these claims. Nevertheless, more studies investigating the effects of ethnicity on students' education in general and students' achievement goals in particular are needed, and a first step would be to raise teacher awareness of the potential impact cultural or ethnic background can have on achievement goals and subsequent learning quality in a pharmacy school environment.

This thesis highlights the importance of the performance-approach goal and its relationship with academic achievement, in addition to the importance of the mastery-approach goal and its relationship with deep learning. It is understood that academics would like to see their students interested in their subjects and employing deep learning strategies when they study. However, marks are the crucial criterion used to differentiate between students academically and determine progression through the degree program. Thus, academics might encourage both types of achievement goals in their students in order for them to reap the benefits of both goals. For example, teachers may encourage students to understand the task at hand and to ask questions during and after lectures and in tutorials to gain a deeper knowledge of the subject, as well as develop engaging and fun competitive tasks. Optimising the academic performance of every student can be achieved through the consideration of the impact of factors such as the type of assessment task, as well as the classroom environment and self-directed learning tasks on encouraging a performance approach orientation to learning.

Knowing what qualities students would like to see in their teachers is essential for academics if they hope to firstly engage their students and secondly know what teaching characteristics are most likely to facilitate student learning and achievement. In addition, understanding these relationships between students’ achievement goals and the qualities they prefer to see in their teachers can help academics to modify their teaching styles to foster the approach type goals and reduce the adoption of avoidance-type goals.

Although the role of tertiary education in lifelong learning has been mitigated by the growth of professional continuing education (Schuetze and Slowey, 2002), preparing pharmacy students to be lifelong learners is a crucial task of faculties and schools of pharmacy. According to Cornford (2002), adopting the mastery-approach goal is the foundational element for lifelong learning as this type of achievement goal is highly linked to deep learning and independent learning strategies (Cornford, 2002; Wolters, 2004). Thus, in order to graduate lifelong learners, pharmacy teachers could adapt their teaching approaches so that their students are encouraged to master tasks, adopt deep learning strategies, ask questions and persist in the face of challenges. There is an obvious challenge here too for teaching academics; finding the balance between fostering life-long learning and facilitating academic achievement and performance can at times be difficult.

10.5 Limitations and future research

Several limitations to this research should be noted. Firstly, the results of the qualitative study were preliminary, as data saturation was not reached. However, the strength of the study was the comparative analysis of data collected simultaneously from both students and their teachers. The findings of this qualitative study suggested that there were some key issues worthy of further investigation. These included student motivation and engagement, academics and students' expectations, students' independent learning skills and the use of multimedia. The next steps could include (i) a study that more comprehensively identifies the needs and challenges facing first-year pharmacy students, and (ii) building an effective transition-to-university pathway so that academics' and students' expectations and preferences are more closely aligned.

Secondly, the fact that a parallel qualitative study was not conducted along with the quantitative studies is another limitation of this project. Future qualitative studies that further explore the results of the quantitative study would be highly beneficial.

Thirdly, few institutions were used in this project. Future pharmacy educational studies that use more institutions would be highly beneficial in order to generalise the findings of this project.

There is evidence to suggest that achievement motivation is enacted through a multiple goal orientation approach to learning (Barron and Harackiewicz, 2001; Linnenbrink, 2005; Smith and Sinclair, 2005). The findings of the current program of research support this. Future research into pharmacy student achievement motivation which investigates this more deeply would be of benefit to both academics and students, would advance theory and provide an evidence base for curriculum development.

Future research might also explore pharmacy teachers' adopted achievement goals and its effects on fostering the adoption of the same goals in their students. Such a study could help in investigating and aligning the achievement goals of both of teachers and students.

10.6 Conclusion

The main objectives of this thesis were to investigate undergraduate pharmacy students' achievement goals and their relation to academic achievement. In addition, the project identified the relationships between students' preferred teacher qualities and their achievement goal orientations.

This doctoral work sought to achieve knowledge construction through a theoretical and empirical exploration of achievement motivation in pharmacy students. The aim was not simply to test existing theory in a novel setting, but to also adopt a fine-grained analysis so as to achieve a deep understanding of the mechanisms behind student motivation and academic achievement. A 'circle' of understanding, in a sense, has been achieved by closing the loop between the initial study investigating undergraduate pharmacy students' perceptions and preferences for how they learn and how their teachers teach, and the final study which investigated the relationships between these preferences, achievement motivation and academic performance.

The researcher hopes the results of the work presented in this thesis will act as a starting point for academics to engage their students in productive and positive approaches to their learning. This thesis has sought to decrease the gap in the literature regarding pharmacy students' achievement goals, with a view to stimulating further investigation into the role of goals and academic achievement, and to inform the nexus between learning and teaching.

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APPENDICES

Appendix 1

Accreditation Standards for Pharmacy Programs in Australia and New Zealand

Australian Pharmacy Council Ltd

Accreditation Standards for Pharmacy Programs in Australia and New Zealand

DECEMBER 2012

EFFECTIVE FROM 1 JANUARY 2014

Accreditation Standards for Pharmacy Programs in Australia and New Zealand

DECEMBER 2012

EFFECTIVE FROM 1 JANUARY 2014

Contents

3. Standards for the Curriculum

3.1 Curriculum Development

Standards

Standard 17

The School of Pharmacy has responsibility and authority for curriculum design and evaluation and has established mechanisms for doing so.

Standard 18

Review of curriculum content, delivery and evaluation and student assessment methods is undertaken through broad stakeholder engagement and use of a consultative and collaborative approach.

Standard 19

Cultural competence and cultural sensitivity are fostered through embedded curriculum content that enables students to develop an appreciation and respect for cultural diversity, and specifically addresses the health and wellbeing of Aboriginal and Torres Strait Islander people in Australia and Māori in New Zealand.

Guidance

It is important for curriculum development to be undertaken through a process which engages individuals with expertise in pharmacy education as well as individuals with expertise in the basic and clinical sciences encompassed within the pharmacy program. Funding arrangements within the University should be supportive of collaborative efforts between schools/disciplines. The curriculum development process should also take account of government health care initiatives and/or health priorities and the evolving roles and perspectives of the pharmacy profession.

The curriculum should provide students with an appreciation for the professional practice issues that arise from practising in a multicultural society. Input to the curriculum on Indigenous health issues and health priorities provided in Australia by Aboriginal and Torres Strait Islander people and in New Zealand by Māori will be important for ensuring the completeness of the program and for assuring a culturally-sensitive program of study. The curriculum should provide opportunities for the development of cultural competence and cultural sensitivity and provide insights and/or experience into differences in health care needs and approaches to practice in urban, rural and remote communities.

Where the School of Pharmacy is grouped in a health sciences faculty with other health care professions some elements of the curriculum may be undertaken with other disciplines. However, in many subject areas the depth or specialised nature of the knowledge required by students will dictate that the content is designed specifically for the pharmacy curriculum.

3.2 Curriculum Management

Standards

Standard 20

The curriculum of the pharmacy program demonstrates congruency with contemporary pharmaceutical sciences, pharmacotherapeutics and pharmacy practice and the pharmacy learning domains.

Standard 21

The School applies a variety of teaching and learning approaches to stimulate student engagement and to enhance student learning.

Guidance

The pharmacy learning domains have been developed to reflect the learning needs of students that arise from consideration of contemporary pharmacy practice, evolving developments in practice and the unique health and educational systems in Australia and New Zealand. The School of Pharmacy should have clearly stated learning outcomes which can be related to the curriculum content.

The range of teaching and learning strategies used should ensure each student becomes familiar with consumer-centred care, contemporary pharmacy practice and collaborative engagement with health care consumers and health professionals. They may include most or all of the following: lectures, practical classes, tutorials, experiential placements, computer-assisted learning, self-directed learning, interactive small group teaching, collaborative case-based learning, problem based learning, and contemporary tools such as the use of virtual or simulated health care consumers and distance learning technology.

3.3 Experiential Placements

Standards

Standard 22

The School of Pharmacy has clearly defined experiential learning outcomes embedded within the curriculum, provides students with learning opportunities in hospital and community practice settings to meet those outcomes, and applies assessment methods for assuring those outcomes are met.

Standard 23

The School of Pharmacy co-ordinates, monitors and regularly reviews the quality and performance of the experiential learning elements of the program.

Standard 24

The School of Pharmacy has clearly documented procedures for management of experiential placements that safeguards students and health care consumers.

Guidance

The experiential placement program develops the foundation communication and clinical skills for professional practice. Experiential learning should start early in the program, with increasing decision-making and level of responsibility over the course of the program. Each placement should have clear learning outcomes. These should be informed by the curriculum to ensure the theoretical base has been laid so that students can experience the placement within the relevant context. Simulated experiences may support the development of clinical skills and competencies required by pharmacists to supplement and complement, but not replace, the placement experience.

Graduates of pharmacy programs will become members of a health profession that upholds defined professional and ethical values. Early and continuing exposure to the workplace and pharmacy practice is important for students gaining an understanding of professional roles and responsibilities, reinforcing learning, and assisting integration of learning with professional practice requirements. However, experiential placements should:

- Be participative, in that each student must be active rather than a passive observer.
- Be interactive between more than just the student and the clinical educator[23] providing guidance to the student while on placement. For example, it should encompass interactions of the student with health care consumers, other health professionals and the practice environment.
- Have a whole-person emphasis. The experiential learning should involve learning in the behavioural and affective as well as the cognitive dimension.
- Involve variability so that each student has the opportunity to integrate learning with real-world situations and understand and recognise the uncertainty that is the reality in clinical practice.
- Balance structure and autonomy. With little guidance, the experience may be meaningless. With too much structure, the ability to be opportunistic with the experiences that present in the placement is stifled.
- Provide each student with the opportunity to articulate their thoughts and feelings as to their learning experiences (e.g. through use of a workbook, e-workbook, diary or group or individual feedback sessions).
- Involve post-placement feedback to each student. Each student needs to be able to articulate their experience and what they have learned, and receive constructive feedback from those involved in their placement which addresses not only knowledge, but also, and especially, skills and professional attributes. Both the outcome of experiences and the processes involved need to be commended and constructive recommendations provided. Where differences occur between expected learning outcomes and the student's learning experience, then contributing key variables should be identified and the dominance of these factors to learning experience reviewed with the student, clinical educator and preceptor.
- Have in place a process to identify and immediately address concerns about the safety of health care consumers arising from the experiential placement and to clarify what students should do if they have concerns about the care provided or the conduct of the clinical educators.
- Have assessment methods appropriate to the learning outcomes with respect to not only knowledge, but also, and especially, skills and professional attributes.

23 In this context the term 'clinical educator' is intended to mean any individual actively guiding the learning that occurs during an experiential placement. This may not necessarily be a pharmacist or the preceptor responsible for the student's learning within the placement.

The experiential placements are, in this way, intended to support achievement of desired learning outcomes. Since most graduates will ultimately find employment in community or hospital pharmacy practice environments, and both Australia and New Zealand have widely dispersed populations across rural and remote settings, it is important for both community and hospital practice settings to be experienced, with consideration being given to inclusion of rural or remote sites for experiential placements. The use of other settings (e.g. general practice, residential care facilities, primary care, community nursing, pharmaceutical industry and policy and regulatory settings) for additional experiential placement experience is encouraged. Placement sites should be selected based on the learning outcomes to be achieved and with the involvement of academic staff.

Prior planning to establish the specific arrangements and objectives for placements is fundamental to their success by ensuring clarity in expectations for the placement. The arrangements and objectives for experiential placements should be clearly documented. It is important for students and preceptors to receive formal advice on the objectives of the experiential placement and the School's expectations of them. This may be achieved through the use of tools such as information sheets, placement handbooks or explicit contracts. Indemnification of students during experiential placements should be provided and evidenced by Universities. A contract may be the most appropriate means of achieving this. Universities should be aware of and ensure students comply with pre-placement human resource and governance requirements of hospitals and other placement sites (e.g. immunisation status).

The School of Pharmacy has an obligation to monitor the quality of the placement experience by seeking feedback from both the students and their preceptors and to use that feedback to improve the placement program, for both current students and those that follow. Suitable arrangements should be in place for debriefing those students whose experience in a placement is unfavourable to minimise any adverse impact and to provide for the experience to be appreciated as a learning opportunity. There should be demonstrable evidence of a quality improvement cycle for evaluation of the experiential placements program.

3.4 Educational Outcomes

Standards

Standard 25

The pharmacy program produces graduates who have the graduate attributes of the University and the knowledge, skills and attitudes necessary to commence supervised practice as an intern pharmacist.

Standard 26

The School of Pharmacy uses a range of assessment methods that are appropriate to the outcomes of the program.

Standard 27

The School of Pharmacy has policies and procedural controls that involve external assessment or moderation to assure integrity, reliability, fairness and transparency in the assessment of students.

Guidance

Since the entry-level competencies are to be met at entry to professional practice, they can serve as a source of guidance to the teaching and learning expected across both the pharmacy degree program and the intern training program[24]. The goal of initial pharmacy education is to produce graduates with the requisite knowledge, skills and attributes for entry to an intern training program, to provide a sound foundation for further advanced training, and to engender a commitment to lifelong learning and professional practice. Graduates will be expected to be able to assume responsibility for safe consumer care at entry to the intern training program (e.g. recognising limitations and confidently referring or seeking substantive documented advice in circumstances beyond their knowledge/skill scope). For these reasons assessment processes will be directed to assessing knowledge, skills and professional attributes in the pharmacy practice context (e.g. OSCEs). Some entry-level competencies may be achieved during the pharmacy program, however, the majority will be achieved through the application of knowledge and skills in the workplace during their internship.

24 In this regard, the *Customised Entry-level Competency Tool for Pharmacists (available at: www.psa.org.au/archives/6230)* may be of assistance for identifying the contributions of pharmacy programs and intern training programs to the learning and development of students and intern pharmacists respectively.

List of Acronyms

AHMAC	Australian Health Ministers' Advisory Council
AHPRA	Australian Health Practitioner Regulation Agency
ALTC	Australian Learning and Teaching Council
APC	Australian Pharmacy Council
APLF	Australian Pharmacy Liaison Forum
AQF	Australian Qualifications Framework
CPD	Continuing Professional Development
CUAP	Committee on University Academic Programmes
ITP	Intern Training Program
NAPSAC	New Zealand and Australian Pharmacy School Accreditation Committee
NRAS	National Registration and Accreditation Scheme
NZQF	New Zealand Qualifications Framework
PBA	Pharmacy Board of Australia
PCNZ	Pharmacy Council of New Zealand
SET	Site Evaluation Team
TEC	Tertiary Education Commission
TEQSA	Tertiary Education Quality and Standards Agency
TLO	Threshold Learning Outcome

Appendix 2

Ethics approval and Interviews’ protocols for Chapter 4

THE UNIVERSITY OF SYDNEY

RESEARCH INTEGRITY
Human Research Ethics Committee
Web: http://sydney.edu.au/ethics/
Email: ro.humanethics@sydney.edu.au

Address for all correspondence:
Level 6, Jane Foss Russell Building - G02
The University of Sydney
NSW 2006 AUSTRALIA

Ref: [IM /KFG]

19 January 2011

Dr Lorraine Smith
Faculty of Pharmacy – A15
The University of Sydney
Email: lorainne.smith@sydney.edu.au

Dear Dr Smith

I am pleased to inform you that the Executive of the Human Research Ethics Committee (HREC) approved your protocol entitled "**Pharmacy students' expectations of teaching and the pharmacy profession**" on **19 January 2011**.

Details of the approval are as follows:

Protocol No.:	**13420**
Approval Period:	**January 2011 to January 2012**
Authorised Personnel:	**Dr Lorraine Smith** **Dr Erica Sainsbury** **Mr Saleh Alrakaf**
Documents Approved:	**Participant Information Statement (Version 1, 14/01/2011)** **Participant Consent Form - Students (Version 1, 14/01/2011)** **Participant Consent Form - Lecturers (Version 1, 14/01/2011)**

The HREC is a fully constituted Ethics Committee in accordance with the National Statement on Ethical Conduct in Research Involving Humans-March 2007 under Section 5.1.29.

The approval of this project is conditional upon your continuing compliance with the National Statement on Ethical Conduct in Research Involving Humans. A report on this research must be submitted every 12 months from the date of the approval or on completion of the project, whichever occurs first. Failure to submit reports will result in withdrawal of consent for the project to proceed. Your report is due by **31 January 2012**.

Chief Investigator / Supervisor's responsibilities to ensure that:

1. All serious and unexpected adverse events should be reported to the HREC within 72 hours for clinical trials/interventional research.

2. All unforeseen events that might affect continued ethical acceptability of the project should be reported to the HREC as soon as possible.

3. Any changes to the protocol must be approved by the HREC before the research project can proceed.

Manager Human Ethics
Dr Margaret Faedo
T: +61 2 8627 8176
E: margaret.faedo @sydney.edu.au

Human Ethics Secretariat:
Ms Karen Greer **T:** +61 2 8627 8171 **E:** karen.greer@sydney.edu.au
Ms Patricia Engelmann **T:** +61 2 8627 8172 **E:** patricia.engelmann@sydney.edu.au
Ms Kala Retnam **T:** +61 2 8627 8173 **E:** kala.retnam@sydney.edu.au

ABN 15 211 513 464
CRICOS 00026A

THE UNIVERSITY OF SYDNEY

4. All research participants are to be provided with a Participant Information Statement and Consent Form, unless otherwise agreed by the Committee. The following statement must appear on the bottom of the Participant Information Statement: *Any person with concerns or complaints about the conduct of a research study can contact the Manager, Human Ethics, University of Sydney on +61 2 8627 8176 (Telephone); + 61 2 8627 8177 (Facsimile) or ro.humanethics@sydney.edu.au (Email).*

5. You must retain copies of all signed Consent Forms and provide these to the HREC on request.

6. It is your responsibility to provide a copy of this letter to any internal/external granting agencies if requested.

7. The HREC approval is valid for four (4) years from the Approval Period stated in this letter. Investigators are requested to submit a progress report annually.

8. A report and a copy of any published material should be provided at the completion of the Project.

Please do not hesitate to contact the Ethics Office should you require further information or clarification.

Yours sincerely

Associate Professor Ian Maxwell
Chair
Human Research Ethics Committee

cc: Mr Saleh Alrakaf salr4982@uni.sydney.edu.au

Appendix 3

Ethics approval and supporting statistics for Chapter 5: An International Validation Study of Two Achievement Goal Measures in Pharmacy Education Context

THE UNIVERSITY OF SYDNEY

RESEARCH INTEGRITY
Human Research Ethics Committee
Web: http://sydney.edu.au/ethics/
Email: ro.humanethics@sydney.edu.au

Address for all correspondence:
Level 6, Jane Foss Russell Building - G02
The University of Sydney
NSW 2006 AUSTRALIA

Ref: IM/PE

28 July 2011

Dr Lorraine Smith
Faculty of Pharmacy
Pharmacy Building – A15
The University of Sydney
Lorraine.smith@sydney.edu.au

Dear Dr Smith

I am pleased to inform you that on 27 July 2011, the Executive of the Human Research Ethics Committee (HREC) approved your protocol entitled "**A Validation Study of two Achievement Goal Questionnaires**".

Details of the approval are as follows:

Protocol No.:	**14018**
Approval Period:	**July 2011 to July 2012**
Annual Report Due:	**31 July 2012**
Authorised Personnel:	**Dr Lorraine Smith** **Dr Erica Sainsbury** **Mr Saleh Alrakaf**

Documents Approved:
Participant Information Statement Version 1, 10 July 2011
Questionnaires Version 1, 10 July 2011

The HREC is a fully constituted Ethics Committee in accordance with the National Statement on Ethical Conduct in Research Involving Humans-March 2007 under Section 5.1.29.

The approval of this project is conditional upon your continuing compliance with the National Statement on Ethical Conduct in Research Involving Humans.

A report on this research must be submitted every 12 months to the Human Research Ethics Committee from the final approval period or on completion of the project, whichever occurs first. Failure to submit reports will result in withdrawal of ethics approval for the project. Please download the Annual Report/Completion Report Form from the Human Ethics website at: http://sydney.edu.au/research_support/ethics/human/forms.

The HREC approval is valid for four (4) years from the Approval Period stated in this letter and is conditional upon submission of Annual Reports. If your project is not completed by four (4) years from the approval period, you will have to submit a Modification Form requesting an extension. Please refer to the guideline on extension of ethics approval which is available on the website at: http://sydney.edu.au/research_support/ethics/human/extension.

- All unforeseen events that might affect continued ethical acceptability of the project should be reported to the HREC as soon as possible.

- Any changes to the protocol including changes to research personnel must be approved by the HREC by submitting a Modification Form before the research project can proceed.

Chief Investigator / Supervisor's responsibilities:

1. You must retain copies of all signed Consent Forms (if applicable) and provide these to the HREC on request.

2. It is your responsibility to provide a copy of this letter to any internal/external granting agencies if requested.

Please do not hesitate to contact Research Integrity (Human Ethics) should you require further information or clarification.

Yours sincerely

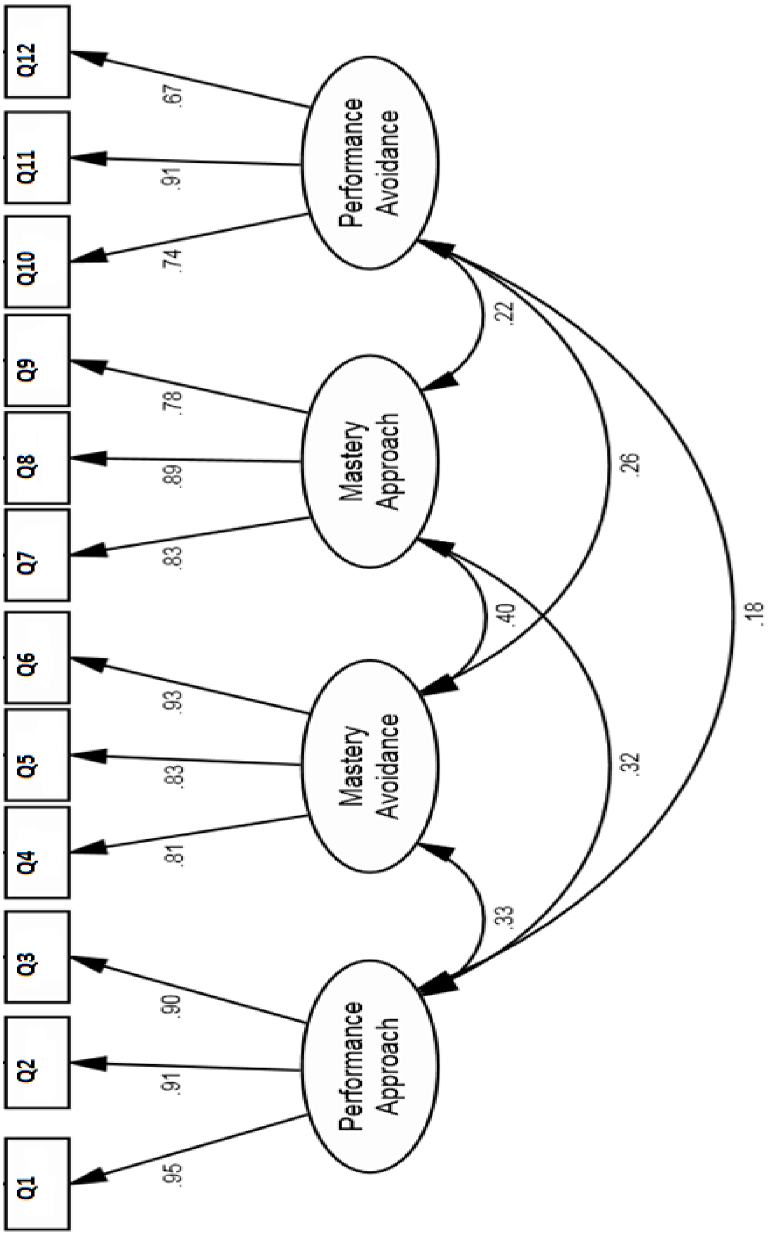
S. J. Assinder

Dr Stephen Assinder
Chair
Human Research Ethics Committee

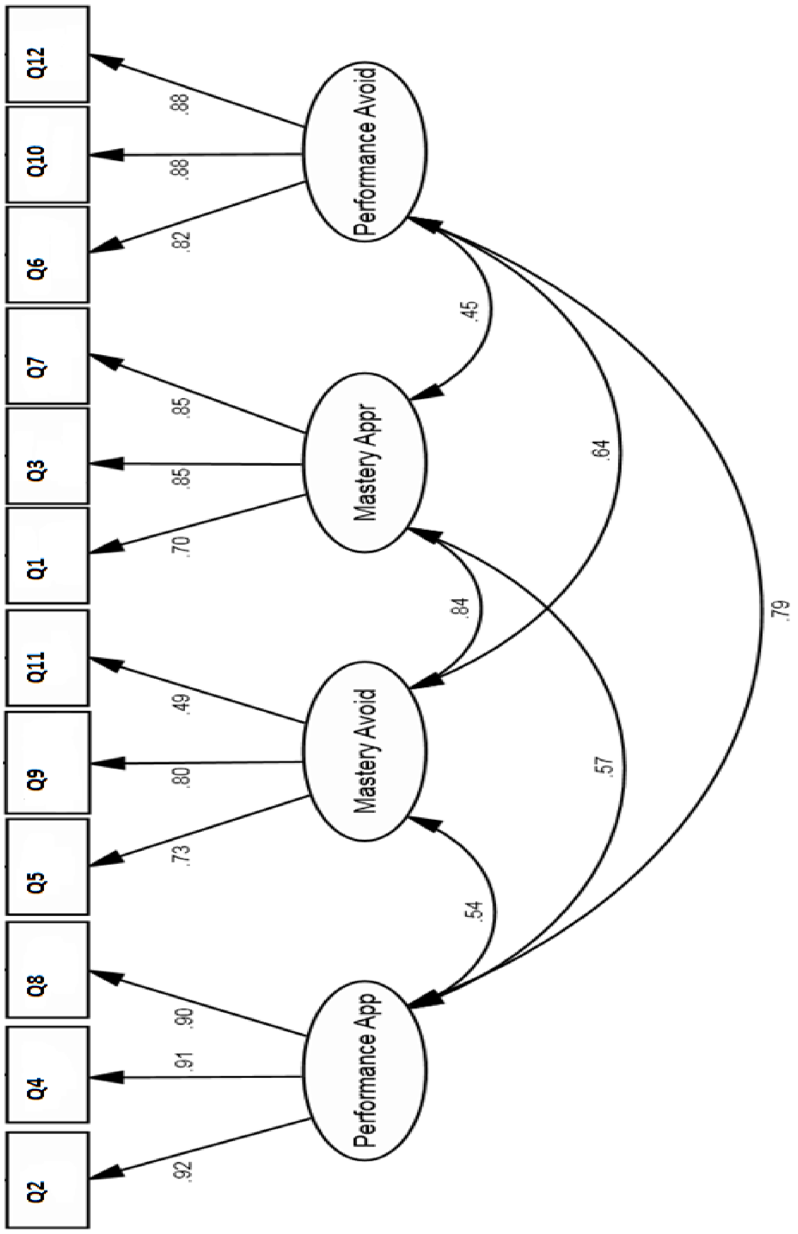
cc: Erica Sainsbury

This HREC is constituted and operates in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2007), NHMRC and Universities Australia Australian Code for the Responsible Conduct of Research (2007) and the CPMP/ICH Note for Guidance on Good Clinical Practice.

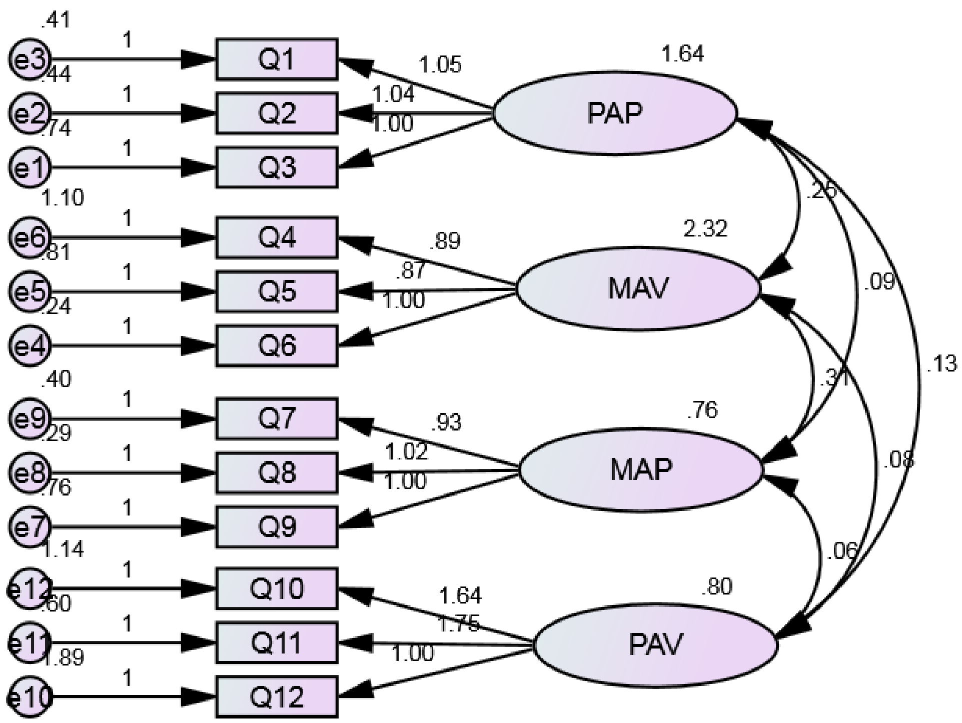
Factor loadings and correlations outputs for the Achievement Goal Questionnaire in Australian sample



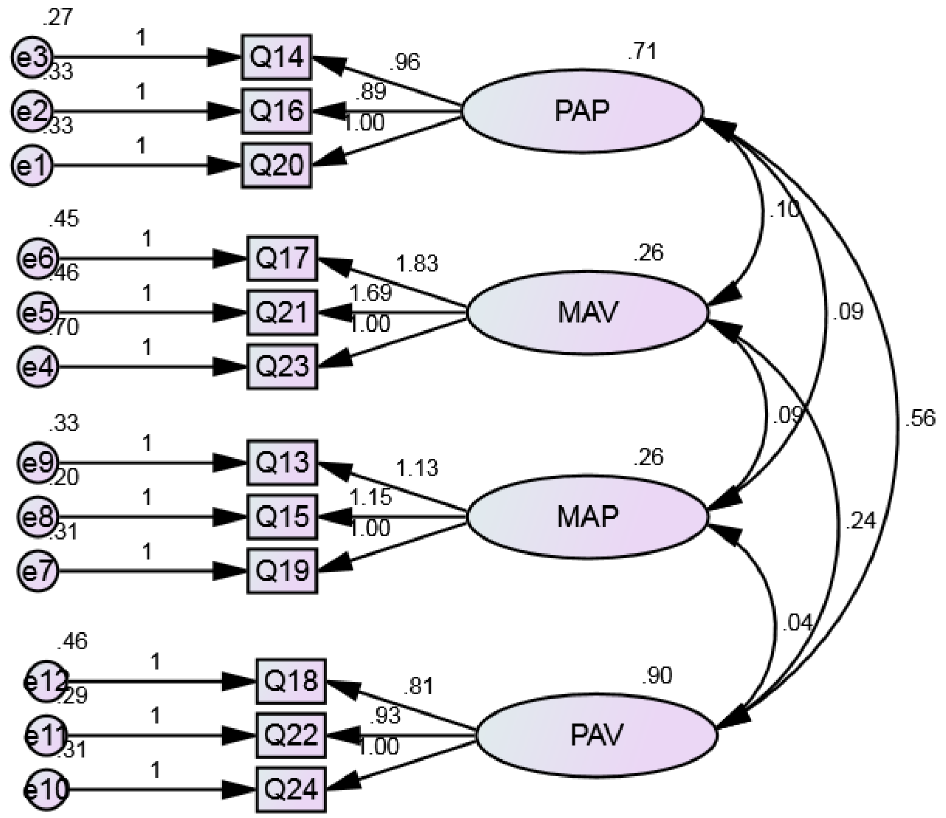
Factor loadings and correlations outputs for the Achievement Goal Questionnaire-Revised in Australian sample



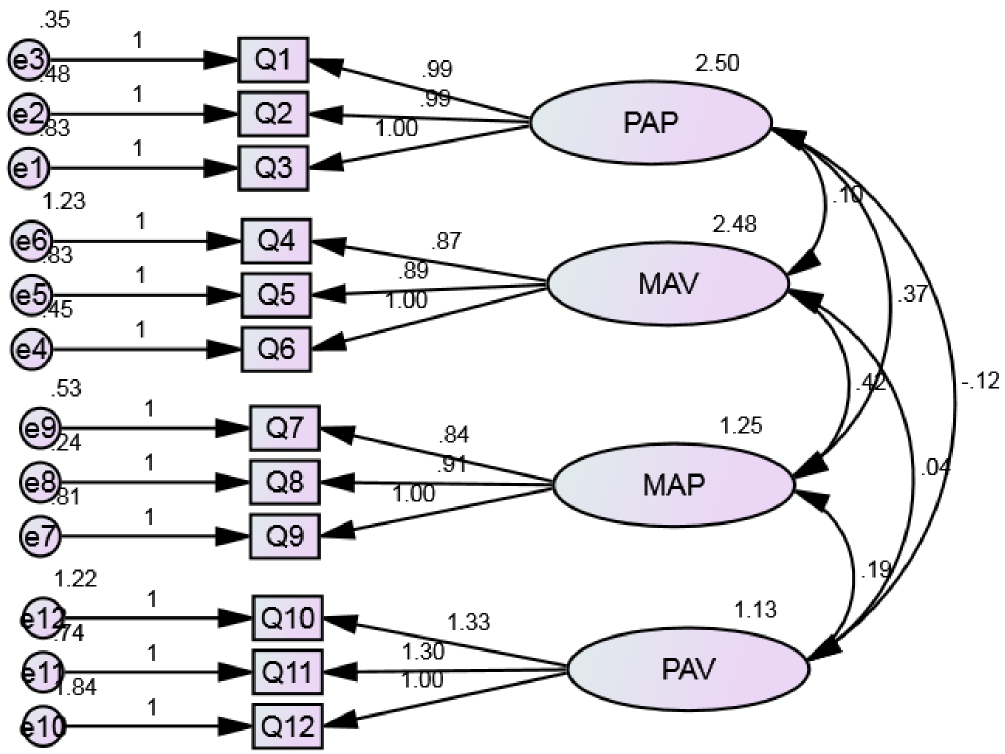
Factor loadings and correlations for the Achievement Goal Questionnaire in UK sample



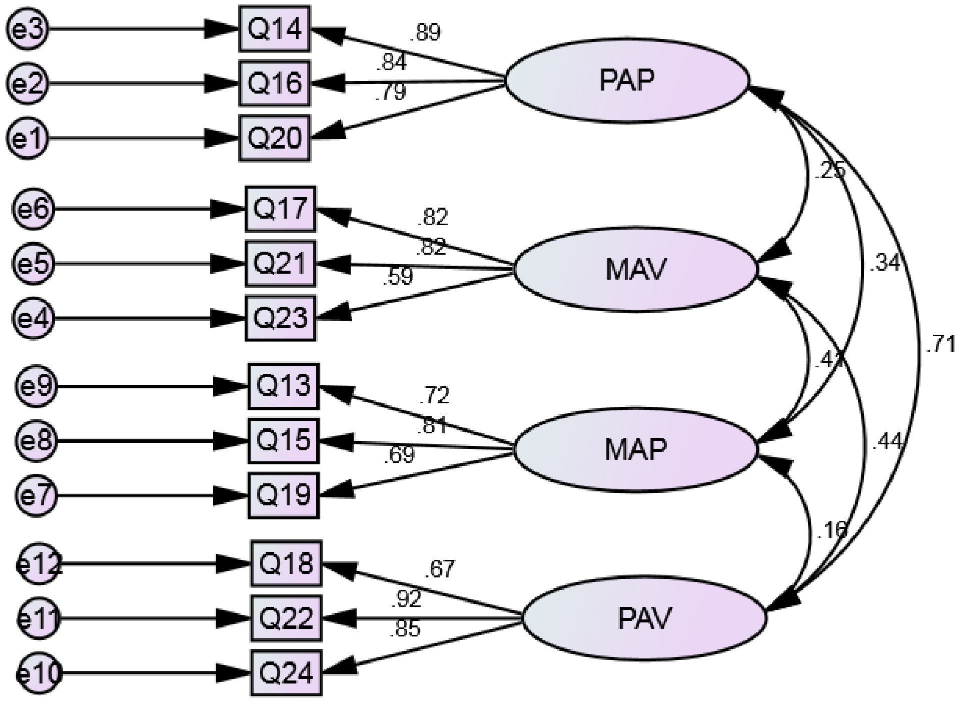
Factor loadings and correlations outputs for the Achievement Goal Questionnaire- Revised in UK sample



Factor loadings and correlations outputs for the Achievement Goal Questionnaire in USA/NZ sample



Factor loadings and correlations outputs for the Achievement Goal Questionnaire-Revised in USA/NZ sample



Appendix 4

Ethics approval and supporting statistics for Chapter 6: Identifying Achievement Goals and their Relation to Academic Achievement and Ethnicity in Undergraduate Pharmacy Students: A Comparative Cross-Sectional Study

THE UNIVERSITY OF SYDNEY

RESEARCH INTEGRITY
Human Research Ethics Committee
Web: http://sydney.edu.au/ethics/
Email: ro.humanethics@sydney.edu.au

Address for all correspondence:
Level 6, Jane Foss Russell Building - G02
The University of Sydney
NSW 2006 AUSTRALIA

Ref: SA/JM

24th April 2012

Dr Lorraine Smith
Faculty of Pharmacy
The University of Sydney
Lorraine.smith@sydney.edu.au

Dear Lorraine,

I am pleased to inform you that the Human Research Ethics Committee (HREC) approved your protocol entitled "Identifying achievement goals and measuring its changes overtime in undergraduate pharmacy: A longitudinal study" at its meeting held on April 17th, 2012

Details of the approval are as follows:

Protocol No.: 14741

Approval Date: 17 April 2012

First Annual Report Due: 30 April 2013

Authorised Personnel: Dr Lorraine Smith
Ms Erica Sainsbury

Documents Approved:

Document	Version Number	Date
Participant information statement	1	Submitted 2/4/12
Questionnaire	1	Submitted 2/4/12

HREC approval is valid for four (4) years from the approval date stated in this letter and is granted pending the following conditions being met:

Condition/s of Approval

- Continuing compliance with the National Statement on Ethical Conduct in Research Involving Humans.
- Provision of an annual report on this research to the Human Research Ethics Committee from the approval date and at the completion of the study. Failure to submit reports will result in withdrawal of ethics approval for the project.
- All serious and unexpected adverse events should be reported to the HREC within 72 hours.

THE UNIVERSITY OF SYDNEY

- All unforeseen events that might affect continued ethical acceptability of the project should be reported to the HREC as soon as possible.

- Any changes to the protocol including changes to research personnel must be approved by the HREC by submitting a Modification Form before the research project can proceed.

Chief Investigator / Supervisor's responsibilities:

1. You must retain copies of all signed Consent Forms (if applicable) and provide these to the HREC on request.

2. It is your responsibility to provide a copy of this letter to any internal/external granting agencies if requested.

Please do not hesitate to contact Research Integrity (Human Ethics) should you require further information or clarification.

Yours sincerely

S. J. Assinder

Dr Stephen Assinder
Chair
Human Research Ethics Committee

cc: Erica Sainsbury

This HREC is constituted and operates in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2007), NHMRC and Universities Australia Australian Code for the Responsible Conduct of Research (2007) and the CPMP/ICH Note for Guidance on Good Clinical Practice.

Independent sample t-test to compare the achievement goal orientations between First and Third year students

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  /VARIABLES=PAPmeans MAVmeans MAPmeans PAVmeans
  /CRITERIA=CI(.95).
```

T-Test

Group Statistics

	Year	N	Mean	Std. Deviation	Std. Error Mean
PAPmeans	Year one	260	5.0628	1.33715	.08293
	Year three	120	4.5278	1.42512	.13010
MAVmeans	Year one	260	4.8141	1.47889	.09172
	Year three	120	4.5722	1.40506	.12826
MAPmeans	Year one	260	5.8955	1.00240	.06217
	Year three	120	5.5736	1.19441	.10903
PAVmeans	Year one	260	5.6410	1.29389	.08024
	Year three	120	5.4861	1.28839	.11761

Independent Samples Test

		Levene's Test for Equality of Variances	
		F	Sig.
PAPmeans	Equal variances assumed	2.513	.114
	Equal variances not assumed		
MAVmeans	Equal variances assumed	.779	.378
	Equal variances not assumed		
MAPmeans	Equal variances assumed	4.801	.029
	Equal variances not assumed		
PAVmeans	Equal variances assumed	.138	.711
	Equal variances not assumed		

Independent Samples Test

		t-test for Equality of Means			
		t	df	Sig. (2-tailed)	Mean Difference
PAPmeans	Equal variances assumed	3.551	378	.000	.53504
	Equal variances not assumed	3.468	218.756	.001	.53504
MAVmeans	Equal variances assumed	1.505	378	.133	.24188
	Equal variances not assumed	1.534	242.656	.126	.24188
MAPmeans	Equal variances assumed	2.735	378	.007	.32190
	Equal variances not assumed	2.565	199.268	.011	.32190
PAVmeans	Equal variances assumed	1.086	378	.278	.15491
	Equal variances not assumed	1.088	232.432	.278	.15491

Independent Samples Test

		t-test for Equality of Means		
		Std. Error Difference	95% Confidence Interval of the Difference	
			Lower	Upper
PAPmeans	Equal variances assumed	.15069	.23874	.83134
	Equal variances not assumed	.15428	.23098	.83910
MAVmeans	Equal variances assumed	.16069	-.07408	.55784
	Equal variances not assumed	.15768	-.06872	.55248
MAPmeans	Equal variances assumed	.11771	.09046	.55335
	Equal variances not assumed	.12551	.07440	.56940
PAVmeans	Equal variances assumed	.14260	-.12548	.43531
	Equal variances not assumed	.14238	-.12560	.43543

Two-way between-groups analysis of variance to explore the impact of students' academic year and predominant languages spoken at home on each achievement goal

```
GET
  FILE='C:\Users\saleh\Desktop\Copy-Project-1&3-1-12.sav'.
DATASET NAME DataSet1 WINDOW=FRONT.
USE ALL.
COMPUTE filter_$=(Language = 1 | Language = 2 | Language = 7 | Language
= 8 | Language = 11).
VARIABLE LABELS filter_$ 'Language = 1 | Language = 2 | Language = 7 |
Language = 8 | Language = 11 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
UNIANOVA PAPmeans BY Language Year
  /METHOD=SSTYPE(1)
  /INTERCEPT=INCLUDE
  /POSTHOC=Language(TUKEY)
  /PLOT=PROFILE(Language*Year)
  /PRINT=ETASQ HOMOGENEITY DESCRIPTIVE
  /CRITERIA=ALPHA(.05)
  /DESIGN=Language Year Language*Year.
```

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Language	1.00	English	119
	2.00	Arabic	36
	7.00	Chinese	94
	8.00	Vietnamese	49
	11.00	Korean	37
Year	1.00	Year one	225
	3.00	Year three	110

Descriptive Statistics

Dependent Variable: PAPmeans

Language	Year	Mean	Std. Deviation	N
English	Year one	4.8493	1.48453	73
	Year three	4.4203	1.54829	46
	Total	4.6835	1.51754	119
Arabic	Year one	4.7000	1.39333	30
	Year three	4.4444	1.31092	6
	Total	4.6574	1.36507	36
Chinese	Year one	5.3118	1.14975	62
	Year three	5.0104	1.14687	32
	Total	5.2092	1.15158	94
Vietnamese	Year one	5.4017	1.11916	39
	Year three	4.5000	1.37212	10
	Total	5.2177	1.21631	49
Korean	Year one	4.5556	1.55397	21
	Year three	4.3125	1.34147	16
	Total	4.4505	1.45130	37
Total	Year one	5.0252	1.35652	225
	Year three	4.5848	1.38669	110
	Total	4.8806	1.38005	335

Levene's Test of Equality of Error Variances[a]

Dependent Variable: PAPmeans

F	df1	df2	Sig.
1.358	9	325	.206

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.[a]

a. Design: Intercept + Language + Year + Language * Year

Tests of Between-Subjects Effects

Dependent Variable: PAPmeans

Source	Type I Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	43.428[a]	9	4.825	2.646	.006	.068
Intercept	7979.776	1	7979.776	4375.731	.000	.931
Language	28.983	4	7.246	3.973	.004	.047
Year	11.890	1	11.890	6.520	.011	.020
Language * Year	2.556	4	.639	.350	.844	.004
Error	592.684	325	1.824			
Total	8615.889	335				
Corrected Total	636.113	334				

a. R Squared = .068 (Adjusted R Squared = .042)

Post Hoc Tests

Language

Multiple Comparisons

Dependent Variable: PAPmeans

Tukey HSD

(I) Language	(J) Language	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
English	Arabic	.0261	.25687	1.000	-.6786	.7307
	Chinese	-.5257*	.18635	.040	-1.0369	-.0146
	Vietnamese	-.5342	.22922	.138	-1.1630	.0946
	Korean	.2330	.25419	.890	-.4643	.9303
Arabic	English	-.0261	.25687	1.000	-.7307	.6786
	Chinese	-.5518	.26468	.229	-1.2779	.1743
	Vietnamese	-.5603	.29644	.325	-1.3734	.2529
	Korean	.2070	.31614	.966	-.6603	1.0742
Chinese	English	.5257*	.18635	.040	.0146	1.0369
	Arabic	.5518	.26468	.229	-.1743	1.2779
	Vietnamese	-.0085	.23794	1.000	-.6612	.6443
	Korean	.7588*	.26208	.033	.0398	1.4777
Vietnamese	English	.5342	.22922	.138	-.0946	1.1630
	Arabic	.5603	.29644	.325	-.2529	1.3734
	Chinese	.0085	.23794	1.000	-.6443	.6612
	Korean	.7672	.29412	.071	-.0396	1.5740
Korean	English	-.2330	.25419	.890	-.9303	.4643
	Arabic	-.2070	.31614	.966	-1.0742	.6603
	Chinese	-.7588*	.26208	.033	-1.4777	-.0398
	Vietnamese	-.7672	.29412	.071	-1.5740	.0396

The error term is Mean Square(Error) = 1.824.

*. The mean difference is significant at the .05 level.

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Language	1.00	English	119
	2.00	Arabic	36
	7.00	Chinese	94
	8.00	Vietnamese	49
	11.00	Korean	37
Year	1.00	Year one	225
	3.00	Year three	110

Descriptive Statistics

Dependent Variable: MAVmeans

Language	Year	Mean	Std. Deviation	N
English	Year one	4.6393	1.61566	73
	Year three	4.1957	1.47836	46
	Total	4.4678	1.57267	119
Arabic	Year one	4.2667	1.56445	30
	Year three	4.3333	.91894	6
	Total	4.2778	1.46602	36
Chinese	Year one	5.1075	1.11420	62
	Year three	4.7292	1.28804	32
	Total	4.9787	1.18312	94
Vietnamese	Year one	5.5299	1.24656	39
	Year three	4.8333	1.24969	10
	Total	5.3878	1.26628	49
Korean	Year one	4.5238	1.48911	21
	Year three	4.6042	1.18145	16
	Total	4.5586	1.34727	37
Total	Year one	4.8622	1.45749	225
	Year three	4.4758	1.34207	110
	Total	4.7353	1.43021	335

Levene's Test of Equality of Error Variances[a]

Dependent Variable: MAVmeans

F	df1	df2	Sig.
1.851	9	325	.059

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.[a]

a. Design: Intercept + Language + Year + Language * Year

Tests of Between-Subjects Effects

Dependent Variable: MAVmeans

Source	Type I Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	56.154[a]	9	6.239	3.234	.001	.082
Intercept	7511.801	1	7511.801	3893.402	.000	.923
Language	43.637	4	10.909	5.654	.000	.065
Year	8.747	1	8.747	4.534	.034	.014
Language * Year	3.770	4	.943	.489	.744	.006
Error	627.044	325	1.929			
Total	8195.000	335				
Corrected Total	683.199	334				

a. R Squared = .082 (Adjusted R Squared = .057)

Post Hoc Tests

Language

Multiple Comparisons

Dependent Variable: MAVmeans

Tukey HSD

(I) Language	(J) Language	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
English	Arabic	.1900	.26421	.952	-.5348	.9148
	Chinese	-.5109	.19167	.061	-1.0367	.0149
	Vietnamese	-.9200*	.23577	.001	-1.5667	-.2732
	Korean	-.0908	.26145	.997	-.8080	.6264
Arabic	English	-.1900	.26421	.952	-.9148	.5348
	Chinese	-.7009	.27225	.077	-1.4478	.0459
	Vietnamese	-1.1100*	.30491	.003	-1.9464	-.2736
	Korean	-.2808	.32517	.910	-1.1728	.6112
Chinese	English	.5109	.19167	.061	-.0149	1.0367
	Arabic	.7009	.27225	.077	-.0459	1.4478
	Vietnamese	-.4090	.24474	.453	-1.0804	.2623
	Korean	.4202	.26957	.525	-.3193	1.1596
Vietnamese	English	.9200*	.23577	.001	.2732	1.5667
	Arabic	1.1100*	.30491	.003	.2736	1.9464
	Chinese	.4090	.24474	.453	-.2623	1.0804
	Korean	.8292	.30252	.050	-.0007	1.6591
Korean	English	.0908	.26145	.997	-.6264	.8080
	Arabic	.2808	.32517	.910	-.6112	1.1728
	Chinese	-.4202	.26957	.525	-1.1596	.3193
	Vietnamese	-.8292	.30252	.050	-1.6591	.0007

The error term is Mean Square(Error) = 1.929.

*. The mean difference is significant at the .05 level.

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Language	1.00	English	119
	2.00	Arabic	36
	7.00	Chinese	94
	8.00	Vietnamese	49
	11.00	Korean	37
Year	1.00	Year one	225
	3.00	Year three	110

Descriptive Statistics

Dependent Variable: MAPmeans

Language	Year	Mean	Std. Deviation	N
English	Year one	6.0114	.95837	73
	Year three	5.4964	1.27002	46
	Total	5.8123	1.11309	119
Arabic	Year one	5.6556	1.11926	30
	Year three	5.3889	1.85492	6
	Total	5.6111	1.24084	36
Chinese	Year one	5.8333	.81146	62
	Year three	5.3229	1.17466	32
	Total	5.6596	.97517	94
Vietnamese	Year one	5.9915	1.08009	39
	Year three	5.8333	.97183	10
	Total	5.9592	1.05109	49
Korean	Year one	5.3889	1.41356	21
	Year three	5.6458	.96201	16
	Total	5.5000	1.22977	37
Total	Year one	5.8533	1.02473	225
	Year three	5.4924	1.20193	110
	Total	5.7348	1.09750	335

Levene's Test of Equality of Error Variances[a]

Dependent Variable: MAPmeans

F	df1	df2	Sig.
2.067	9	325	.032

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.[a]

a. Design: Intercept + Language + Year + Language * Year

Tests of Between-Subjects Effects

Dependent Variable: MAPmeans

Source	Type I Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	20.443[a]	9	2.271	1.933	.047	.051
Intercept	11017.556	1	11017.556	9376.968	.000	.967
Language	6.305	4	1.576	1.341	.254	.016
Year	9.158	1	9.158	7.795	.006	.023
Language * Year	4.980	4	1.245	1.060	.377	.013
Error	381.862	325	1.175			
Total	11419.861	335				
Corrected Total	402.305	334				

a. R Squared = .051 (Adjusted R Squared = .025)

Post Hoc Tests

Language

Multiple Comparisons

Dependent Variable: MAPmeans

Tukey HSD

(I) Language	(J) Language	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
English	Arabic	.2012	.20618	.866	-.3644	.7668
	Chinese	.1528	.14958	.845	-.2576	.5631
	Vietnamese	-.1469	.18399	.931	-.6516	.3579
	Korean	.3123	.20403	.543	-.2474	.8720
Arabic	English	-.2012	.20618	.866	-.7668	.3644
	Chinese	-.0485	.21246	.999	-.6313	.5343
	Vietnamese	-.3481	.23794	.587	-1.0008	.3046
	Korean	.1111	.25376	.992	-.5850	.8072
Chinese	English	-.1528	.14958	.845	-.5631	.2576
	Arabic	.0485	.21246	.999	-.5343	.6313
	Vietnamese	-.2996	.19099	.519	-.8235	.2243
	Korean	.1596	.21037	.942	-.4175	.7366
Vietnamese	English	.1469	.18399	.931	-.3579	.6516
	Arabic	.3481	.23794	.587	-.3046	1.0008
	Chinese	.2996	.19099	.519	-.2243	.8235
	Korean	.4592	.23608	.296	-.1884	1.1068
Korean	English	-.3123	.20403	.543	-.8720	.2474
	Arabic	-.1111	.25376	.992	-.8072	.5850
	Chinese	-.1596	.21037	.942	-.7366	.4175
	Vietnamese	-.4592	.23608	.296	-1.1068	.1884

The error term is Mean Square(Error) = 1.175.

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Language	1.00	English	119
	2.00	Arabic	36
	7.00	Chinese	94
	8.00	Vietnamese	49
	11.00	Korean	37
Year	1.00	Year one	225
	3.00	Year three	110

Descriptive Statistics

Dependent Variable: PAVmeans

Language	Year	Mean	Std. Deviation	N
English	Year one	5.5708	1.30937	73
	Year three	5.5942	1.26279	46
	Total	5.5798	1.28622	119
Arabic	Year one	5.2667	1.51468	30
	Year three	6.2778	.80046	6
	Total	5.4352	1.46237	36
Chinese	Year one	5.6452	1.23234	62
	Year three	5.3646	1.18036	32
	Total	5.5496	1.21589	94
Vietnamese	Year one	5.9316	1.07654	39
	Year three	5.7667	1.25757	10
	Total	5.8980	1.10387	49
Korean	Year one	5.8095	1.34813	21
	Year three	5.3125	1.13182	16
	Total	5.5946	1.26719	37
Total	Year one	5.6356	1.28773	225
	Year three	5.5394	1.20141	110
	Total	5.6040	1.25905	335

Levene's Test of Equality of Error Variances[a]

Dependent Variable: PAVmeans

F	df1	df2	Sig.
.993	9	325	.446

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.[a]

a. Design: Intercept + Language + Year + Language * Year

Tests of Between-Subjects Effects

Dependent Variable: PAVmeans

Source	Type I Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	14.859[a]	9	1.651	1.043	.406	.028
Intercept	10520.539	1	10520.539	6644.309	.000	.953
Language	5.611	4	1.403	.886	.473	.011
Year	.510	1	.510	.322	.571	.001
Language * Year	8.739	4	2.185	1.380	.241	.017
Error	514.602	325	1.583			
Total	11050.000	335				
Corrected Total	529.461	334				

a. R Squared = .028 (Adjusted R Squared = .001)

Post Hoc Tests

Language

Multiple Comparisons

Dependent Variable: PAVmeans

Tukey HSD

(I) Language	(J) Language	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
English	Arabic	.1446	.23935	.974	-.5119	.8012
	Chinese	.0302	.17364	1.000	-.4461	.5065
	Vietnamese	-.3181	.21359	.570	-.9040	.2678
	Korean	-.0148	.23685	1.000	-.6645	.6350
Arabic	English	-.1446	.23935	.974	-.8012	.5119
	Chinese	-.1145	.24663	.990	-.7910	.5621
	Vietnamese	-.4628	.27622	.451	-1.2205	.2949
	Korean	-.1594	.29458	.983	-.9675	.6487
Chinese	English	-.0302	.17364	1.000	-.5065	.4461
	Arabic	.1145	.24663	.990	-.5621	.7910
	Vietnamese	-.3483	.22172	.517	-.9565	.2599
	Korean	-.0449	.24421	1.000	-.7149	.6250
Vietnamese	English	.3181	.21359	.570	-.2678	.9040
	Arabic	.4628	.27622	.451	-.2949	1.2205
	Chinese	.3483	.22172	.517	-.2599	.9565
	Korean	.3034	.27406	.803	-.4484	1.0552
Korean	English	.0148	.23685	1.000	-.6350	.6645
	Arabic	.1594	.29458	.983	-.6487	.9675
	Chinese	.0449	.24421	1.000	-.6250	.7149
	Vietnamese	-.3034	.27406	.803	-1.0552	.4484

The error term is Mean Square(Error) = 1.583.

Two-way between-groups analysis of variance to explore the impact of students' academic year and predominant languages spoken at home on academic achievement

Between-Subjects Factors

		Value Label	N
Language	1.00	English	112
	2.00	Arabic	34
	7.00	Chinese	87
	8.00	Vietnamese	46
	11.00	Korean	32
Year	1.00	Year one	208
	3.00	Year three	103

Descriptive Statistics

Dependent Variable: Marks

Language	Year	Mean	Std. Deviation	N
English	Year one	71.4627	9.03583	67
	Year three	74.9778	9.60939	45
	Total	72.8750	9.38863	112
Arabic	Year one	72.5000	8.54400	28
	Year three	75.8333	10.43871	6
	Total	73.0882	8.82616	34
Chinese	Year one	70.7241	6.68802	58
	Year three	76.0000	7.11136	29
	Total	72.4828	7.23663	87
Vietnamese	Year one	68.7105	7.37383	38
	Year three	70.6250	7.63334	8
	Total	69.0435	7.36948	46
Korean	Year one	65.0000	9.35414	17
	Year three	72.7333	9.20766	15
	Total	68.6250	9.94095	32
Total	Year one	70.3654	8.26208	208
	Year three	74.6505	8.78357	103
	Total	71.7846	8.66297	311

Levene's Test of Equality of Error Variances[a]

Dependent Variable: Marks

F	df1	df2	Sig.
1.334	9	301	.218

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.[a]

a. Design: Intercept + Language + Year + Language * Year

Tests of Between-Subjects Effects

Dependent Variable: Marks

Source	Type I Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2324.888[a]	9	258.321	3.713	.000
Intercept	1602590.434	1	1602590.434	23036.635	.000
Language	898.443	4	224.611	3.229	.013
Year	1255.604	1	1255.604	18.049	.000
Language * Year	170.840	4	42.710	.614	.653
Error	20939.678	301	69.567		
Total	1625855.000	311			
Corrected Total	23264.566	310			

Tests of Between-Subjects Effects

Dependent Variable: Marks

Source	Partial Eta Squared
Corrected Model	.100[a]
Intercept	.987
Language	.041
Year	.057
Language * Year	.008
Error	
Total	
Corrected Total	

a. R Squared = .100 (Adjusted R Squared = .073)

Post Hoc Tests

Language

Multiple Comparisons

Dependent Variable: Marks

Tukey HSD

(I) Language	(J) Language	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
English	Arabic	-.2132	1.63316	1.000	-4.6953	4.2688
	Chinese	.3922	1.19195	.997	-2.8789	3.6634
	Vietnamese	3.8315	1.46064	.069	-.1770	7.8401
	Korean	4.2500	1.67186	.084	-.3382	8.8382
Arabic	English	.2132	1.63316	1.000	-4.2688	4.6953
	Chinese	.6055	1.68692	.996	-4.0241	5.2350
	Vietnamese	4.0448	1.88638	.204	-1.1322	9.2217
	Korean	4.4632	2.05428	.193	-1.1745	10.1010
Chinese	English	-.3922	1.19195	.997	-3.6634	2.8789
	Arabic	-.6055	1.68692	.996	-5.2350	4.0241
	Vietnamese	3.4393	1.52051	.160	-.7336	7.6121
	Korean	3.8578	1.72441	.169	-.8747	8.5902
Vietnamese	English	-3.8315	1.46064	.069	-7.8401	.1770
	Arabic	-4.0448	1.88638	.204	-9.2217	1.1322
	Chinese	-3.4393	1.52051	.160	-7.6121	.7336
	Korean	.4185	1.91997	.999	-4.8507	5.6876
Korean	English	-4.2500	1.67186	.084	-8.8382	.3382
	Arabic	-4.4632	2.05428	.193	-10.1010	1.1745
	Chinese	-3.8578	1.72441	.169	-8.5902	.8747
	Vietnamese	-.4185	1.91997	.999	-5.6876	4.8507

The error term is Mean Square(Error) = 69.567.

Logistic regression predicting academic achievement

```
LOGISTIC REGRESSION VARIABLES CreditAbove
  /METHOD=ENTER PAPmeans MAVmeans MAPmeans PAVmeans Age Gender
EnglishOther
  /CONTRAST (Gender)=Indicator(1)
  /CONTRAST (EnglishOther)=Indicator(1)
  /CLASSPLOT
  /CASEWISE OUTLIER(2)
  /PRINT=GOODFIT CI(95)
  /CRITERIA=PIN(0.05) POUT(0.10) ITERATE(20) CUT(0.5).
```

Logistic Regression

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	349	91.8
	Missing Cases	31	8.2
	Total	380	100.0
Unselected Cases		0	.0
Total		380	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
Credit	0
Above	1

Categorical Variables Codings

		Frequency	Parameter coding (1)
Language (Binned)	1	112	.000
	2	237	1.000
Gender	Male	111	.000
	Female	238	1.000

Block 0: Beginning Block

Classification Table[a,b]

Observed			Predicted		
			Marks (Binned)		Percentage Correct
			Credit	Above	
Step 0	Marks (Binned)	Credit	215	0	100.0
		Above	134	0	.0
	Overall Percentage				61.6

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.473	.110	18.453	1	.000	.623

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	PAPmeans	.002	1	.961
		MAVmeans	10.635	1	.001
		MAPmeans	2.297	1	.130
		PAVmeans	5.553	1	.018
		Age	.011	1	.916
		Gender(1)	2.447	1	.118
		EnglishOther(1)	5.555	1	.018
	Overall Statistics		22.392	7	.002

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	22.906	7	.002
	Block	22.906	7	.002
	Model	22.906	7	.002

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	441.939[a]	.064	.086

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	4.422	8	.817

Contingency Table for Hosmer and Lemeshow Test

		Marks (Binned) = Credit		Marks (Binned) = Above		Total
		Observed	Expected	Observed	Expected	
Step 1	1	28	28.156	7	6.844	35
	2	26	26.011	9	8.989	35
	3	27	24.725	8	10.275	35
	4	25	23.556	10	11.444	35
	5	24	22.679	11	12.321	35
	6	21	21.502	14	13.498	35
	7	16	20.018	19	14.982	35
	8	16	18.838	19	16.162	35
	9	18	16.845	17	18.155	35
	10	14	12.669	20	21.331	34

Appendix 5

Instrument used and supporting statistics for Chapter 7: Do achievement goals change over time?

Note: Ethics approval for this chapter is the same as Chapter 6.

Classification Table[a]

Observed			Predicted		
			Marks (Binned)		Percentage Correct
			Credit	Above	
Step 1	Marks (Binned)	Credit	190	25	88.4
		Above	99	35	26.1
	Overall Percentage				64.5

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	PAPmeans	.073	.086	.724	1	.395	1.076
	MAVmeans	-.191	.085	5.099	1	.024	.826
	MAPmeans	-.113	.112	1.032	1	.310	.893
	PAVmeans	-.157	.090	3.031	1	.082	.854
	Age	.007	.038	.033	1	.857	1.007
	Gender(1)	.554	.257	4.648	1	.031	1.740
	EnglishOther(1)	-.558	.248	5.079	1	.024	.572
	Constant	1.446	1.177	1.509	1	.219	4.245

Variables in the Equation

		95% C.I.for EXP(B)	
		Lower	Upper
Step 1[a]	PAPmeans	.909	1.273
	MAVmeans	.700	.975
	MAPmeans	.717	1.111
	PAVmeans	.716	1.020
	Age	.934	1.086
	Gender(1)	1.052	2.879
	EnglishOther(1)	.352	.930
	Constant		

a. Variable(s) entered on step 1: PAPmeans, MAVmeans, MAPmeans, PAVmeans, Age, Gender, EnglishOther.

Casewise List[b]

Case	Selected Status[a]	Observed	Predicted	Predicted Group	Temporary Variable	
		Marks (Binned)			Resid	ZResid
372	S	A**	.137	C	.863	2.507

a. S = Selected, U = Unselected cases, and ** = Misclassified cases.

b. Cases with studentized residuals greater than 2.000 are listed.

Achievement Goal Questionnaire

1	2	3	4	5	6	7
Not at all true of me						Very true of me

1- It is important for me to do better than other students.	1	2	3	4	5	6	7
2- It is important for me to do well compared to others in this class	1	2	3	4	5	6	7
3- My goal in this class is to get a better grade than most of the other students.	1	2	3	4	5	6	7
4- I worry that I may not learn all that I possibly could in this class.	1	2	3	4	5	6	7
5- Sometimes I'm afraid that I may not understand the content of this class as thoroughly as I'd like.	1	2	3	4	5	6	7
6- I am often concerned that I may not learn all that there is to learn in this class.	1	2	3	4	5	6	7
7- I want to learn as much as possible from this class.	1	2	3	4	5	6	7
8- It is important for me to understand the content of this course as thoroughly as possible.	1	2	3	4	5	6	7
9- I desire to completely master the material presented in this class.	1	2	3	4	5	6	7
10- I just want to avoid doing poorly in this class.	1	2	3	4	5	6	7
11- My goal in this class is to avoid performing poorly.	1	2	3	4	5	6	7
12- My fear of performing poorly in this class is often what motivates me.	1	2	3	4	5	6	7

Paired sample t test to measure differences in achievement goals for Cohort I (year 1 to year 2 students)

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Year1MAP	5.8585	126	1.03389	.09211
	Year2MAP	5.7817	126	.97511	.08687
Pair 2	Year1MAV	4.7593	126	1.44754	.12896
	Year2MAV	4.3810	126	1.44205	.12847
Pair 3	Year1PAP	5.1958	126	1.20905	.10771
	Year2PAP	4.6399	126	1.38437	.12333
Pair 4	Year1PAV	5.5899	126	1.39852	.12459
	Year2PAV	5.3914	126	1.40747	.12539

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Year1MAP & Year2MAP	126	.014	.880
Pair 2	Year1MAV & Year2MAV	126	-.063	.481
Pair 3	Year1PAP & Year2PAP	126	-.017	.852
Pair 4	Year1PAV & Year2PAV	126	.089	.322

Paired Samples Test

		Paired Differences			
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference
					Lower
Pair 1	Year1MAP - Year2MAP	.07680	1.41148	.12574	-.17207
Pair 2	Year1MAV - Year2MAV	.37831	2.10704	.18771	.00680
Pair 3	Year1PAP - Year2PAP	.55585	1.85322	.16510	.22910
Pair 4	Year1PAV - Year2PAV	.19852	1.89378	.16871	-.13538

		Paired Differences	t	df	Sig. (2-tailed)
		95% Confidence Interval of the Difference			
		Upper			
Pair 1	Year1MAP - Year2MAP	.32566	.611	125	.542
Pair 2	Year1MAV - Year2MAV	.74981	2.015	125	.046
Pair 3	Year1PAP - Year2PAP	.88260	3.367	125	.001
Pair 4	Year1PAV - Year2PAV	.53242	1.177	125	.242

Paired sample t test to measure differences in achievement goals for Cohort II (year 3 to year 4 students)

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Year3PAP	4.4775	67	1.45335	.17755
	Year4PAP	4.4621	67	1.43824	.17571
Pair 2	Year3PAV	5.6470	67	1.27528	.15580
	Year4PAV	4.8160	67	1.70099	.20781
Pair 3	Year3MAP	5.5599	67	1.18429	.14468
	Year4MAP	5.2337	67	1.53080	.18702
Pair 4	Year3MAV	4.5275	67	1.48957	.18198
	Year4MAV	4.2487	67	1.57487	.19240

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Year3PAP & Year4PAP	67	-.041	.744
Pair 2	Year3PAV & Year4PAV	67	-.044	.727
Pair 3	Year3MAP & Year4MAP	67	-.277	.023
Pair 4	Year3MAV & Year4MAV	67	-.384	.001

Paired Samples Test

		Paired Differences			
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference
					Lower
Pair 1	Year3PAP - Year4PAP	.01537	2.08585	.25483	-.49341
Pair 2	Year3PAV - Year4PAV	.83104	2.16991	.26510	.30176
Pair 3	Year3MAP - Year4MAP	.32612	2.17954	.26627	-.20551
Pair 4	Year3MAV - Year4MAV	.27881	2.54964	.31149	-.34310

		Paired Differences	t	df	Sig. (2-tailed)
		95% Confidence Interval of the Difference			
		Upper			
Pair 1	Year3PAP - Year4PAP	.52415	.060	66	.952
Pair 2	Year3PAV - Year4PAV	1.36033	3.135	66	.003
Pair 3	Year3MAP - Year4MAP	.85775	1.225	66	.225
Pair 4	Year3MAV - Year4MAV	.90071	.895	66	.374

Appendix 6

Supporting statistics for Chapter 8: An International Comparison Study of Pharmacy Students' Achievement Goals and their Relationship to Assessment Type and Marks

Note: Ethics approval for this chapter is the same as Chapter 6.

A one-way repeated measures ANOVA test for Sydney University's sample

Within-Subjects Factors

Measure: MEASURE_1

Sydney	Dependent Variable
1	PAPMEAN
2	MAVMEAN
3	MAPMEAN
4	PAVMEAN

Descriptive Statistics

	Mean	Std. Deviation	N
PAPMEAN	4.4425	1.46837	174
MAVMEAN	4.2816	1.47471	174
MAPMEAN	5.6666	1.06755	174
PAVMEAN	5.3676	1.33727	174

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
Sydney	Pillai's Trace	.503	57.723[b]	3.000	171.000	.000
	Wilks' Lambda	.497	57.723[b]	3.000	171.000	.000
	Hotelling's Trace	1.013	57.723[b]	3.000	171.000	.000
	Roy's Largest Root	1.013	57.723[b]	3.000	171.000	.000

Multivariate Tests[a]

Effect		Partial Eta Squared
Sydney	Pillai's Trace	.503
	Wilks' Lambda	.503
	Hotelling's Trace	.503
	Roy's Largest Root	.503

a. Design: Intercept

Within Subjects Design: Sydney

b. Exact statistic

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]
					Greenhouse-Geisser
Sydney	.917	14.801	5	.011	.945

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Epsilon	
	Huynh-Feldt	Lower-bound
Sydney	.963	.333

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.[a]

a. Design: Intercept

Within Subjects Design: Sydney

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F
Sydney	Sphericity Assumed	242.187	3	80.729	56.801
	Greenhouse-Geisser	242.187	2.836	85.409	56.801
	Huynh-Feldt	242.187	2.888	83.866	56.801
	Lower-bound	242.187	1.000	242.187	56.801
Error(Sydney)	Sphericity Assumed	737.629	519	1.421	
	Greenhouse-Geisser	737.629	490.563	1.504	
	Huynh-Feldt	737.629	499.587	1.476	
	Lower-bound	737.629	173.000	4.264	

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Sig.	Partial Eta Squared
Sydney	Sphericity Assumed	.000	.247
	Greenhouse-Geisser	.000	.247
	Huynh-Feldt	.000	.247
	Lower-bound	.000	.247
Error(Sydney)	Sphericity Assumed		
	Greenhouse-Geisser		
	Huynh-Feldt		
	Lower-bound		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	Sydney	Type III Sum of Squares	df	Mean Square	F	Sig.
Sydney	Linear	150.588	1	150.588	81.423	.000
	Quadratic	.830	1	.830	.666	.416
	Cubic	90.769	1	90.769	77.660	.000
Error(Sydney)	Linear	319.955	173	1.849		
	Quadratic	215.470	173	1.245		
	Cubic	202.204	173	1.169		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	Sydney	Partial Eta Squared
Sydney	Linear	.320
	Quadratic	.004
	Cubic	.310
Error(Sydney)	Linear	
	Quadratic	
	Cubic	

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	16981.843	1	16981.843	5669.860	.000	.970
Error	518.154	173	2.995			

Estimated Marginal Means

Sydney

Estimates

Measure: MEASURE_1

Sydney	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	4.442	.111	4.223	4.662
2	4.282	.112	4.061	4.502
3	5.667	.081	5.507	5.826
4	5.368	.101	5.167	5.568

Pairwise Comparisons

Measure: MEASURE_1

(I) Sydney	(J) Sydney	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	.161	.126	1.000	-.176	.498
	3	-1.224*	.122	.000	-1.549	-.899
	4	-.925*	.145	.000	-1.312	-.538
2	1	-.161	.126	1.000	-.498	.176
	3	-1.385*	.117	.000	-1.697	-1.073
	4	-1.086*	.136	.000	-1.448	-.724
3	1	1.224*	.122	.000	.899	1.549
	2	1.385*	.117	.000	1.073	1.697
	4	.299	.119	.078	-.019	.617
4	1	.925*	.145	.000	.538	1.312
	2	1.086*	.136	.000	.724	1.448
	3	-.299	.119	.078	-.617	.019

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	.503	57.723[a]	3.000	171.000	.000	.503
Wilks' lambda	.497	57.723[a]	3.000	171.000	.000	.503
Hotelling's trace	1.013	57.723[a]	3.000	171.000	.000	.503
Roy's largest root	1.013	57.723[a]	3.000	171.000	.000	.503

Each F tests the multivariate effect of Sydney. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

A one-way repeated measures ANOVA test for University of Otago's sample

Within-Subjects Factors

Measure: MEASURE_1

Otago2	Dependent Variable
1	PAPMEAN
2	MAVMEAN
3	MAPMEAN
4	PAVMEAN

Descriptive Statistics

	Mean	Std. Deviation	N
PAPMEAN	4.6741	1.45080	90
MAVMEAN	4.8148	1.39565	90
MAPMEAN	5.9259	1.04192	90
PAVMEAN	5.1148	1.52970	90

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
Otago2	Pillai's Trace	.498	28.806[b]	3.000	87.000	.000
	Wilks' Lambda	.502	28.806[b]	3.000	87.000	.000
	Hotelling's Trace	.993	28.806[b]	3.000	87.000	.000
	Roy's Largest Root	.993	28.806[b]	3.000	87.000	.000

Multivariate Tests[a]

Effect		Partial Eta Squared
Otago2	Pillai's Trace	.498
	Wilks' Lambda	.498
	Hotelling's Trace	.498
	Roy's Largest Root	.498

a. Design: Intercept

Within Subjects Design: Otago2

b. Exact statistic

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]
					Greenhouse-Geisser
Otago2	.830	16.354	5	.006	.900

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Epsilon	
	Huynh-Feldt	Lower-bound
Otago2	.931	.333

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.[a]

a. Design: Intercept
 Within Subjects Design: Otago2

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F
Otago2	Sphericity Assumed	84.682	3	28.227	17.354
	Greenhouse-Geisser	84.682	2.699	31.374	17.354
	Huynh-Feldt	84.682	2.792	30.334	17.354
	Lower-bound	84.682	1.000	84.682	17.354
Error(Otago2)	Sphericity Assumed	434.290	267	1.627	
	Greenhouse-Geisser	434.290	240.223	1.808	
	Huynh-Feldt	434.290	248.457	1.748	
	Lower-bound	434.290	89.000	4.880	

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Sig.	Partial Eta Squared
Otago2	Sphericity Assumed	.000	.163
	Greenhouse-Geisser	.000	.163
	Huynh-Feldt	.000	.163
	Lower-bound	.000	.163
Error(Otago2)	Sphericity Assumed		
	Greenhouse-Geisser		
	Huynh-Feldt		
	Lower-bound		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	Otago2	Type III Sum of Squares	df	Mean Square	F	Sig.
Otago2	Linear	26.645	1	26.645	14.954	.000
	Quadratic	20.385	1	20.385	10.946	.001
	Cubic	37.652	1	37.652	30.477	.000
Error(Otago2)	Linear	158.583	89	1.782		
	Quadratic	165.753	89	1.862		
	Cubic	109.954	89	1.235		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	Otago2	Partial Eta Squared
Otago2	Linear	.144
	Quadratic	.110
	Cubic	.255
Error(Otago2)	Linear	
	Quadratic	
	Cubic	

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	9482.978	1	9482.978	3649.319	.000	.976
Error	231.272	89	2.599			

Pairwise Comparisons

Measure: MEASURE_1

(I) Otago2	(J) Otago2	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	-.141	.196	1.000	-.670	.388
	3	-1.252*	.160	.000	-1.684	-.820
	4	-.441	.204	.198	-.990	.109
2	1	.141	.196	1.000	-.388	.670
	3	-1.111*	.160	.000	-1.543	-.679
	4	-.300	.221	1.000	-.896	.296
3	1	1.252*	.160	.000	.820	1.684
	2	1.111*	.160	.000	.679	1.543
	4	.811*	.192	.000	.293	1.330
4	1	.441	.204	.198	-.109	.990
	2	.300	.221	1.000	-.296	.896
	3	-.811*	.192	.000	-1.330	-.293

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	.498	28.806[a]	3.000	87.000	.000	.498
Wilks' lambda	.502	28.806[a]	3.000	87.000	.000	.498
Hotelling's trace	.993	28.806[a]	3.000	87.000	.000	.498
Roy's largest root	.993	28.806[a]	3.000	87.000	.000	.498

Each F tests the multivariate effect of Otago2. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

A one-way repeated measures ANOVA test for Cardiff University's sample

Within-Subjects Factors

Measure: MEASURE_1

Cardiff2	Dependent Variable
1	PAPMEAN
2	MAVMEAN
3	MAPMEAN
4	PAVMEAN

Descriptive Statistics

	Mean	Std. Deviation	N
PAPMEAN	4.4205	1.52125	86
MAVMEAN	4.2558	1.53450	86
MAPMEAN	6.3217	.80431	86
PAVMEAN	5.0233	1.45143	86

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
Cardiff2	Pillai's Trace	.733	75.771[b]	3.000	83.000	.000
	Wilks' Lambda	.267	75.771[b]	3.000	83.000	.000
	Hotelling's Trace	2.739	75.771[b]	3.000	83.000	.000
	Roy's Largest Root	2.739	75.771[b]	3.000	83.000	.000

Multivariate Tests[a]

Effect		Partial Eta Squared
Cardiff2	Pillai's Trace	.733
	Wilks' Lambda	.733
	Hotelling's Trace	.733
	Roy's Largest Root	.733

a. Design: Intercept

Within Subjects Design: Cardiff2

b. Exact statistic

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]
					Greenhouse-Geisser
Cardiff2	.793	19.369	5	.002	.894

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Epsilon	
	Huynh-Feldt	Lower-bound
Cardiff2	.926	.333

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.[a]

a. Design: Intercept
 Within Subjects Design: Cardiff2

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F
Cardiff2	Sphericity Assumed	226.775	3	75.592	42.466
	Greenhouse-Geisser	226.775	2.681	84.585	42.466
	Huynh-Feldt	226.775	2.777	81.673	42.466
	Lower-bound	226.775	1.000	226.775	42.466
Error(Cardiff2)	Sphericity Assumed	453.913	255	1.780	
	Greenhouse-Geisser	453.913	227.887	1.992	
	Huynh-Feldt	453.913	236.012	1.923	
	Lower-bound	453.913	85.000	5.340	

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Sig.	Partial Eta Squared
Cardiff2	Sphericity Assumed	.000	.333
	Greenhouse-Geisser	.000	.333
	Huynh-Feldt	.000	.333
	Lower-bound	.000	.333
Error(Cardiff2)	Sphericity Assumed		
	Greenhouse-Geisser		
	Huynh-Feldt		
	Lower-bound		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	Cardiff2	Type III Sum of Squares	df	Mean Square	F	Sig.
Cardiff2	Linear	64.535	1	64.535	30.927	.000
	Quadratic	27.634	1	27.634	13.531	.000
	Cubic	134.605	1	134.605	111.134	.000
Error(Cardiff2)	Linear	177.366	85	2.087		
	Quadratic	173.595	85	2.042		
	Cubic	102.952	85	1.211		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	Cardiff2	Partial Eta Squared
Cardiff2	Linear	.267
	Quadratic	.137
	Cubic	.567
Error(Cardiff2)	Linear	
	Quadratic	
	Cubic	

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	8618.343	1	8618.343	4138.818	.000	.980
Error	176.997	85	2.082			

Pairwise Comparisons

Measure: MEASURE_1

(I) Cardiff2	(J) Cardiff2	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	.165	.227	1.000	-.449	.778
	3	-1.901*	.191	.000	-2.416	-1.386
	4	-.603	.224	.051	-1.207	.002
2	1	-.165	.227	1.000	-.778	.449
	3	-2.066*	.163	.000	-2.506	-1.625
	4	-.767*	.225	.006	-1.376	-.159
3	1	1.901*	.191	.000	1.386	2.416
	2	2.066*	.163	.000	1.625	2.506
	4	1.298*	.182	.000	.808	1.789
4	1	.603	.224	.051	-.002	1.207
	2	.767*	.225	.006	.159	1.376
	3	-1.298*	.182	.000	-1.789	-.808

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	.733	75.771[a]	3.000	83.000	.000	.733
Wilks' lambda	.267	75.771[a]	3.000	83.000	.000	.733
Hotelling's trace	2.739	75.771[a]	3.000	83.000	.000	.733
Roy's largest root	2.739	75.771[a]	3.000	83.000	.000	.733

Each F tests the multivariate effect of Cardiff2. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

A one-way repeated measures ANOVA test for Nottingham University's sample

Within-Subjects Factors

Measure: MEASURE_1

NottinAGs	Dependent Variable
1	PAPMEAN
2	MAVMEAN
3	MAPMEAN
4	PAVMEAN

Descriptive Statistics

	Mean	Std. Deviation	N
PAPMEAN	4.5012	1.34933	135
MAVMEAN	4.2827	1.35098	135
MAPMEAN	5.7481	.99039	135
PAVMEAN	5.0519	1.45061	135

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
NottinAGs	Pillai's Trace	.509	45.619[b]	3.000	132.000	.000
	Wilks' Lambda	.491	45.619[b]	3.000	132.000	.000
	Hotelling's Trace	1.037	45.619[b]	3.000	132.000	.000
	Roy's Largest Root	1.037	45.619[b]	3.000	132.000	.000

Multivariate Tests[a]

Effect		Partial Eta Squared
NottinAGs	Pillai's Trace	.509
	Wilks' Lambda	.509
	Hotelling's Trace	.509
	Roy's Largest Root	.509

a. Design: Intercept

Within Subjects Design: NottinAGs

b. Exact statistic

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]
					Greenhouse-Geisser
NottinAGs	.930	9.629	5	.086	.952

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Epsilon	
	Huynh-Feldt	Lower-bound
NottinAGs	.975	.333

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.[a]

a. Design: Intercept

Within Subjects Design: NottinAGs

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F
NottinAGs	Sphericity Assumed	173.124	3	57.708	37.116
	Greenhouse-Geisser	173.124	2.857	60.589	37.116
	Huynh-Feldt	173.124	2.926	59.165	37.116
	Lower-bound	173.124	1.000	173.124	37.116
Error(NottinAGs)	Sphericity Assumed	625.035	402	1.555	
	Greenhouse-Geisser	625.035	382.884	1.632	
	Huynh-Feldt	625.035	392.103	1.594	
	Lower-bound	625.035	134.000	4.664	

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Sig.	Partial Eta Squared
NottinAGs	Sphericity Assumed	.000	.217
	Greenhouse-Geisser	.000	.217
	Huynh-Feldt	.000	.217
	Lower-bound	.000	.217
Error(NottinAGs)	Sphericity Assumed		
	Greenhouse-Geisser		
	Huynh-Feldt		
	Lower-bound		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	NottinAGs	Type III Sum of Squares	df	Mean Square	F	Sig.
NottinAGs	Linear	65.593	1	65.593	40.248	.000
	Quadratic	7.704	1	7.704	4.489	.036
	Cubic	99.827	1	99.827	75.722	.000
Error(NottinAGs)	Linear	218.381	134	1.630		
	Quadratic	229.997	134	1.716		
	Cubic	176.657	134	1.318		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	NottinAGs	Partial Eta Squared
NottinAGs	Linear	.231
	Quadratic	.032
	Cubic	.361
Error(NottinAGs)	Linear	
	Quadratic	
	Cubic	

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	12944.175	1	12944.175	6263.727	.000	.979
Error	276.915	134	2.067			

Measure: MEASURE_1

(I) NottinAGs	(J) NottinAGs	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]
					Lower Bound
1	2	.219	.151	.901	-.186
	3	-1.247*	.136	.000	-1.612
	4	-.551*	.155	.003	-.966
2	1	-.219	.151	.901	-.623
	3	-1.465*	.140	.000	-1.840
	4	-.769*	.172	.000	-1.229
3	1	1.247*	.136	.000	.881
	2	1.465*	.140	.000	1.091
	4	.696*	.154	.000	.285
4	1	.551*	.155	.003	.135
	2	.769*	.172	.000	.309
	3	-.696*	.154	.000	-1.108

Measure: MEASURE_1

(I) NottinAGs	(J) NottinAGs	95% Confidence Interval for Difference
		Upper Bound
1	2	.623
	3	-.881*
	4	-.135*
2	1	.186
	3	-1.091*
	4	-.309*
3	1	1.612*
	2	1.840*
	4	1.108*
4	1	.966*
	2	1.229*
	3	-.285*

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

One-way repeated measures ANOVA used to compare Students' achievement in all universities

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean
						Lower Bound
PAPMEAN	Nottingham	136	4.4975	1.34501	.11533	4.2695
	Cardiff	86	4.4205	1.52125	.16404	4.0944
	Otago	90	4.6741	1.45080	.15293	4.3702
	Sydney	174	4.4425	1.46837	.11132	4.2228
	Total	486	4.4969	1.43958	.06530	4.3686
MAVMEAN	Nottingham	135	4.2827	1.35098	.11627	4.0527
	Cardiff	86	4.2558	1.53450	.16547	3.9268
	Otago	90	4.8148	1.39565	.14711	4.5225
	Sydney	174	4.2816	1.47471	.11180	4.0609
	Total	485	4.3763	1.44858	.06578	4.2470
MAPMEAN	Nottingham	135	5.7481	.99039	.08524	5.5796
	Cardiff	86	6.3217	.80431	.08673	6.1493
	Otago	90	5.9259	1.04192	.10983	5.7077
	Sydney	174	5.6666	1.06755	.08093	5.5069
	Total	485	5.8536	1.02359	.04648	5.7623
PAVMEAN	Nottingham	135	5.0519	1.45061	.12485	4.8049
	Cardiff	86	5.0233	1.45143	.15651	4.7121
	Otago	90	5.1148	1.52970	.16124	4.7944
	Sydney	174	5.3676	1.33727	.10138	5.1675
	Total	485	5.1717	1.42981	.06492	5.0442

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
PAPMEAN	Between Groups	3.842	3	1.281	.617	.605
	Within Groups	1001.265	482	2.077		
	Total	1005.107	485			
MAVMEAN	Between Groups	21.299	3	7.100	3.435	.017
	Within Groups	994.315	481	2.067		
	Total	1015.615	484			
MAPMEAN	Between Groups	26.901	3	8.967	8.982	.000
	Within Groups	480.206	481	.998		
	Total	507.107	484			
PAVMEAN	Between Groups	10.802	3	3.601	1.770	.152
	Within Groups	978.668	481	2.035		
	Total	989.470	484			

Robust Tests of Equality of Means

		Statistic[a]	df1	df2	Sig.
PAPMEAN	Welch	.596	3	229.179	.618
	Brown-Forsythe	.609	3	400.240	.609
MAVMEAN	Welch	3.570	3	229.861	.015
	Brown-Forsythe	3.416	3	402.410	.017
MAPMEAN	Welch	11.662	3	237.777	.000
	Brown-Forsythe	9.422	3	430.319	.000
PAVMEAN	Welch	1.868	3	226.113	.136
	Brown-Forsythe	1.713	3	393.661	.164

a. Asymptotically F distributed.

Post Hoc Tests

Multiple Comparisons

Tukey HSD

Dependent Variable	(I) University	(J) University	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
PAPMEAN	Nottingham	Cardiff	.07701	.19857	.980	-.4349	.5889
		Otago	-.17653	.19585	.804	-.6814	.3284
		Sydney	.05508	.16496	.987	-.3702	.4804
	Cardiff	Nottingham	-.07701	.19857	.980	-.5889	.4349
		Otago	-.25353	.21734	.648	-.8138	.3068
		Sydney	-.02193	.18998	.999	-.5117	.4678
	Otago	Nottingham	.17653	.19585	.804	-.3284	.6814
		Cardiff	.25353	.21734	.648	-.3068	.8138
		Sydney	.23160	.18714	.603	-.2508	.7140
	Sydney	Nottingham	-.05508	.16496	.987	-.4804	.3702
		Cardiff	.02193	.18998	.999	-.4678	.5117
		Otago	-.23160	.18714	.603	-.7140	.2508
MAVMEAN	Nottingham	Cardiff	.02690	.19837	.999	-.4845	.5383
		Otago	-.53210*	.19566	.034	-1.0365	-.0277
		Sydney	.00116	.16490	1.000	-.4240	.4263
	Cardiff	Nottingham	-.02690	.19837	.999	-.5383	.4845
		Otago	-.55900*	.21681	.050	-1.1179	-.0001
		Sydney	-.02574	.18952	.999	-.5143	.4628
	Otago	Nottingham	.53210*	.19566	.034	.0277	1.0365
		Cardiff	.55900*	.21681	.050	.0001	1.1179
		Sydney	.53326*	.18668	.023	.0520	1.0145
	Sydney	Nottingham	-.00116	.16490	1.000	-.4263	.4240
		Cardiff	.02574	.18952	.999	-.4628	.5143
		Otago	-.53326*	.18668	.023	-1.0145	-.0520
MAPMEAN	Nottingham	Cardiff	-.57356*	.13785	.000	-.9290	-.2182
		Otago	-.17778	.13597	.559	-.5283	.1728
		Sydney	.08154	.11460	.893	-.2139	.3770
	Cardiff	Nottingham	.57356*	.13785	.000	.2182	.9290
		Otago	.39578*	.15067	.044	.0073	.7842
		Sydney	.65510*	.13171	.000	.3156	.9946
	Otago	Nottingham	.17778	.13597	.559	-.1728	.5283
		Cardiff	-.39578*	.15067	.044	-.7842	-.0073
		Sydney	.25932	.12973	.190	-.0751	.5938

		Nottingham	-.08154	.11460	.893	-.3770	.2139
	Sydney	Cardiff	-.65510*	.13171	.000	-.9946	-.3156
		Otago	-.25932	.12973	.190	-.5938	.0751
		Cardiff	.02860	.19680	.999	-.4788	.5360
	Nottingham	Otago	-.06296	.19411	.988	-.5634	.4375
		Sydney	-.31573	.16360	.217	-.7375	.1060
		Nottingham	-.02860	.19680	.999	-.5360	.4788
	Cardiff	Otago	-.09156	.21510	.974	-.6461	.4630
		Sydney	-.34433	.18802	.260	-.8291	.1404
PAVMEAN		Nottingham	.06296	.19411	.988	-.4375	.5634
	Otago	Cardiff	.09156	.21510	.974	-.4630	.6461
		Sydney	-.25277	.18520	.522	-.7302	.2247
		Nottingham	.31573	.16360	.217	-.1060	.7375
	Sydney	Cardiff	.34433	.18802	.260	-.1404	.8291
		Otago	.25277	.18520	.522	-.2247	.7302

*. The mean difference is significant at the 0.05 level.

Multiple regression predicting MCQ scores

Descriptive Statistics

	Mean	Std. Deviation	N
MCQ30	44.3294	29.55120	252
MAPMEAN	5.8536	1.02359	485
PAPMEAN	4.4969	1.43958	486
MAVMEAN	4.3763	1.44858	485
PAVMEAN	5.1717	1.42981	485
Gender	1.6680	.47140	485

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Gender, PAPMEAN, PAVMEAN, MAPMEAN, MAVMEAN[b]	.	Enter

a. Dependent Variable: MCQ30

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.276[a]	.076	.057	28.69464

a. Predictors: (Constant), Gender, PAPMEAN, PAVMEAN, MAPMEAN, MAVMEAN

b. Dependent Variable: MCQ30

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16639.628	5	3327.926	4.042	.002[b]
	Residual	202552.034	246	823.382		
	Total	219191.663	251			

a. Dependent Variable: MCQ30

b. Predictors: (Constant), Gender, PAPMEAN, PAVMEAN, MAPMEAN, MAVMEAN

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	40.604	13.854		2.931	.004
	MAPMEAN	1.584	1.830	.055	.866	.387
	PAPMEAN	1.105	1.303	.054	.848	.397
	MAVMEAN	3.707	1.307	.182	2.837	.005
	PAVMEAN	-2.923	1.281	-.141	-2.281	.023
	Gender	-6.969	3.876	-.111	-1.798	.073

Coefficients[a]

Model		95.0% Confidence Interval for B		Correlations			Collinearity Statistics
		Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance
1	(Constant)	13.315	67.892				
	MAPMEAN	-2.020	5.189	.090	.055	.053	.935
	PAPMEAN	-1.462	3.672	.086	.054	.052	.932
	MAVMEAN	1.134	6.281	.191	.178	.174	.916
	PAVMEAN	-5.447	-.399	-.135	-.144	-.140	.977
	Gender	-14.604	.666	-.112	-.114	-.110	.982

Coefficients[a]

Model		Collinearity Statistics
		VIF
1	(Constant)	
	MAPMEAN	1.070
	PAPMEAN	1.073
	MAVMEAN	1.092
	PAVMEAN	1.023
	Gender	1.018

a. Dependent Variable: MCQ30

Multiple regression predicting short essay scores

Descriptive Statistics

	Mean	Std. Deviation	N
Written	62.1414	14.20768	453
MAPMEAN	5.8536	1.02359	485
PAPMEAN	4.4969	1.43958	486
MAVMEAN	4.3763	1.44858	485
PAVMEAN	5.1717	1.42981	485
Gender	1.6680	.47140	485

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Gender, PAPMEAN, PAVMEAN, MAPMEAN, MAVMEAN[b]	.	Enter

a. Dependent Variable: Written

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.212[a]	.045	.034	13.96240

a. Predictors: (Constant), Gender, PAPMEAN, PAVMEAN, MAPMEAN, MAVMEAN

b. Dependent Variable: Written

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4097.948	5	819.590	4.204	.001[b]
	Residual	87141.975	447	194.948		
	Total	91239.923	452			

a. Dependent Variable: Written

b. Predictors: (Constant), Gender, PAPMEAN, PAVMEAN, MAPMEAN, MAVMEAN

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	51.902	5.024		10.332	.000
	MAPMEAN	1.744	.664	.126	2.629	.009
	PAPMEAN	.409	.473	.041	.865	.387
	MAVMEAN	.007	.474	.001	.015	.988
	PAVMEAN	-1.351	.465	-.136	-2.907	.004
	Gender	3.084	1.406	.102	2.194	.029

Coefficients[a]

Model		95.0% Confidence Interval for B		Correlations			Collinearity Statistics
		Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance
1	(Constant)	42.030	61.775				
	MAPMEAN	.440	3.048	.136	.123	.122	.935
	PAPMEAN	-.520	1.338	.048	.041	.040	.932
	MAVMEAN	-.924	.938	.035	.001	.001	.916
	PAVMEAN	-2.264	-.438	-.117	-.136	-.134	.977
	Gender	.322	5.846	.098	.103	.101	.982

Coefficients[a]

Model		Collinearity Statistics
		VIF
1	(Constant)	
	MAPMEAN	1.070
	PAPMEAN	1.073
	MAVMEAN	1.092
	PAVMEAN	1.023
	Gender	1.018

a. Dependent Variable: Written

Appendix 7

Ethics approval and supporting statistics for Chapter 9: An Investigation of the relationship between pharmacy students' preferred teacher qualities and their achievement goal orientations

THE UNIVERSITY OF SYDNEY

Research Integrity
Human Research Ethics Committee

Monday, 15 July 2013

Dr Lorraine Smith
Pharmacy; Faculty of Pharmacy
Email: lorraine.smith@sydney.edu.au

Dear Dr Smith,

Your request to modify the above project submitted on 28 June 2013 was considered by the Executive of the Human Research Ethics Committee at its meeting on 10 July 2013.

The Committee had no ethical objections to the modification/s and has approved the project to proceed.

Details of the approval are as follows:

Project No.: **2012/820**

Project Title: **Identifying achievement goals and measuring its changes overtime in undergraduate pharmacy students: A longitudinal study.**

Approved Documents:

Date Uploaded	**Type**	**Document Name**
28/06/2013	Participant Info Statement	PIS clean copy
28/06/2013	Questionnaires/Surveys	Survey clean copy

Please do not hesitate to contact Research Integrity (Human Ethics) should you require further information or clarification.

Yours sincerely

S. J. Assinder

Dr Stephen Assinder
Chair
Human Research Ethics Committee

This HREC is constituted and operates in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2007), NHMRC and Universities Australia Australian Code for the Responsible Conduct of Research (2007) and the CPMP/ICH Note for Guidance on Good Clinical Practice.

A split-plot ANOVA design (SPANOVA), with academic year as the between-subjects factor and teachers' qualities as the within-subjects factor

Within-Subjects Factors

Measure: MEASURE_1

Qualities	Dependent Variable
1	Enthusiastic
2	Challenging
3	Expertise
4	Succeed
5	Presentation
6	Workload
7	Interactive
8	Warm
9	Feedback

Between-Subjects Factors

		Value Label	N
Year	2.00	Year two	155
	4.00	Year four	163

Descriptive Statistics

	Year	Mean	Std. Deviation	N
Enthusiastic	Year two	3.0710	1.83795	155
	Year four	3.1166	2.41240	163
	Total	3.0943	2.14841	318
Challenging	Year two	1.7677	1.52817	155
	Year four	1.8589	1.75639	163
	Total	1.8145	1.64715	318
Expertise	Year two	3.0645	1.86101	155
	Year four	3.1104	2.16312	163
	Total	3.0881	2.01848	318
Succeed	Year two	2.5484	1.87323	155
	Year four	2.3252	2.08724	163
	Total	2.4340	1.98584	318
Presentation	Year two	2.9097	2.11785	155
	Year four	2.7730	2.18666	163
	Total	2.8396	2.15109	318
Workload	Year two	1.6903	1.57318	155
	Year four	1.5337	1.71155	163
	Total	1.6101	1.64484	318
Interactive	Year two	1.6194	1.47829	155
	Year four	1.5215	1.54095	163
	Total	1.5692	1.50915	318
Warm	Year two	1.5742	1.32875	155
	Year four	1.7914	1.90663	163
	Total	1.6855	1.65145	318
Feedback	Year two	1.7097	1.40022	155
	Year four	2.0491	1.98078	163
	Total	1.8836	1.72813	318

Box's Test of Equality of Covariance Matrices[a]

Box's M	349.720
F	7.539
df1	45
df2	326341.938
Sig.	.000

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.[a]

a. Design: Intercept + Year

Within Subjects Design: Qualities

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
Qualities	Pillai's Trace	.443	30.725[b]	8.000	309.000	.000
	Wilks' Lambda	.557	30.725[b]	8.000	309.000	.000
	Hotelling's Trace	.795	30.725[b]	8.000	309.000	.000
	Roy's Largest Root	.795	30.725[b]	8.000	309.000	.000
Qualities * Year	Pillai's Trace	.022	.879[b]	8.000	309.000	.535
	Wilks' Lambda	.978	.879[b]	8.000	309.000	.535
	Hotelling's Trace	.023	.879[b]	8.000	309.000	.535
	Roy's Largest Root	.023	.879[b]	8.000	309.000	.535

Multivariate Tests[a]

Effect		Partial Eta Squared
Qualities	Pillai's Trace	.443
	Wilks' Lambda	.443
	Hotelling's Trace	.443
	Roy's Largest Root	.443
Qualities * Year	Pillai's Trace	.022
	Wilks' Lambda	.022
	Hotelling's Trace	.022
	Roy's Largest Root	.022

a. Design: Intercept + Year

Within Subjects Design: Qualities

b. Exact statistic

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b]
					Greenhouse-Geisser
Qualities	.565	178.565	35	.000	.875

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

Within Subjects Effect	Epsilon	
	Huynh-Feldt	Lower-bound
Qualities	.900	.125

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.[a]

a. Design: Intercept + Year

Within Subjects Design: Qualities

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F
Qualities	Sphericity Assumed	1052.059	8	131.507	34.378
	Greenhouse-Geisser	1052.059	7.002	150.246	34.378
	Huynh-Feldt	1052.059	7.200	146.124	34.378
	Lower-bound	1052.059	1.000	1052.059	34.378
Qualities * Year	Sphericity Assumed	21.908	8	2.739	.716
	Greenhouse-Geisser	21.908	7.002	3.129	.716
	Huynh-Feldt	21.908	7.200	3.043	.716
	Lower-bound	21.908	1.000	21.908	.716
Error(Qualities)	Sphericity Assumed	9670.448	2528	3.825	
	Greenhouse-Geisser	9670.448	2212.702	4.370	
	Huynh-Feldt	9670.448	2275.121	4.251	
	Lower-bound	9670.448	316.000	30.603	

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Sig.	Partial Eta Squared
Qualities	Sphericity Assumed	.000	.098
	Greenhouse-Geisser	.000	.098
	Huynh-Feldt	.000	.098
	Lower-bound	.000	.098
Qualities * Year	Sphericity Assumed	.678	.002
	Greenhouse-Geisser	.659	.002
	Huynh-Feldt	.663	.002
	Lower-bound	.398	.002
Error(Qualities)	Sphericity Assumed		
	Greenhouse-Geisser		
	Huynh-Feldt		
	Lower-bound		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	Qualities	Type III Sum of Squares	df	Mean Square	F	Sig.
Qualities	Linear	439.382	1	439.382	96.421	.000
	Quadratic	.074	1	.074	.016	.900
	Cubic	39.243	1	39.243	9.901	.002
	Order 4	168.208	1	168.208	40.517	.000
	Order 5	194.238	1	194.238	65.433	.000
	Order 6	16.549	1	16.549	5.228	.023
	Order 7	37.962	1	37.962	11.664	.001
	Order 8	156.404	1	156.404	39.794	.000
Qualities * Year	Linear	2.351	1	2.351	.516	.473
	Quadratic	14.567	1	14.567	3.159	.076
	Cubic	1.625	1	1.625	.410	.522
	Order 4	1.622	1	1.622	.391	.532
	Order 5	.006	1	.006	.002	.964
	Order 6	.249	1	.249	.079	.779
	Order 7	1.076	1	1.076	.331	.566
	Order 8	.412	1	.412	.105	.746
Error(Qualities)	Linear	1439.988	316	4.557		
	Quadratic	1457.258	316	4.612		
	Cubic	1252.480	316	3.964		
	Order 4	1311.876	316	4.152		
	Order 5	938.047	316	2.969		
	Order 6	1000.312	316	3.166		
	Order 7	1028.488	316	3.255		
	Order 8	1241.999	316	3.930		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	Qualities	Partial Eta Squared
Qualities	Linear	.234
	Quadratic	.000
	Cubic	.030
	Order 4	.114
	Order 5	.172
	Order 6	.016
	Order 7	.036
	Order 8	.112
Qualities * Year	Linear	.002
	Quadratic	.010
	Cubic	.001
	Order 4	.001
	Order 5	.000
	Order 6	.000
	Order 7	.001
	Order 8	.000
Error(Qualities)	Linear	
	Quadratic	
	Cubic	
	Order 4	
	Order 5	
	Order 6	
	Order 7	
	Order 8	

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
Enthusiastic	8.723	1	316	.003
Challenging	1.367	1	316	.243
Expertise	3.742	1	316	.054
Succeed	.728	1	316	.394
Presentation	.894	1	316	.345
Workload	.315	1	316	.575
Interactive	1.052	1	316	.306
Warm	10.601	1	316	.001
Feedback	7.736	1	316	.006

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.[a]

a. Design: Intercept + Year

Within Subjects Design: Qualities

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	14148.830	1	14148.830	148678.028	.000	.998
Year	.138	1	.138	1.447	.230	.005
Error	30.072	316	.095			

Estimated Marginal Means

1. Grand Mean

Measure: MEASURE_1

Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
2.224	.006	2.213	2.235

2. Qualities

Estimates

Measure: MEASURE_1

Qualities	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	3.094	.121	2.856	3.331
2	1.813	.093	1.631	1.995
3	3.087	.113	2.864	3.311
4	2.437	.111	2.218	2.656
5	2.841	.121	2.604	3.079
6	1.612	.092	1.430	1.794
7	1.570	.085	1.404	1.737
8	1.683	.093	1.501	1.865
9	1.879	.097	1.689	2.069

Pairwise Comparisons

Measure: MEASURE_1

(I) Qualities	(J) Qualities	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	1.280*	.154	.000	.783	1.778
	3	.006	.179	1.000	-.570	.583
	4	.657*	.175	.007	.093	1.221
	5	.252	.195	1.000	-.376	.881
	6	1.482*	.169	.000	.935	2.028
	7	1.523*	.147	.000	1.048	1.999
	8	1.411*	.157	.000	.906	1.916
	9	1.214*	.166	.000	.678	1.750
2	1	-1.280*	.154	.000	-1.778	-.783
	3	-1.274*	.139	.000	-1.721	-.827
	4	-.623*	.159	.004	-1.137	-.110
	5	-1.028*	.168	.000	-1.571	-.485
	6	.201	.144	1.000	-.263	.665
	7	.243	.126	1.000	-.162	.648
	8	.131	.139	1.000	-.317	.578
	9	-.066	.147	1.000	-.542	.410
3	1	-.006	.179	1.000	-.583	.570
	2	1.274*	.139	.000	.827	1.721
	4	.651*	.172	.007	.096	1.206
	5	.246	.172	1.000	-.308	.800
	6	1.475*	.159	.000	.964	1.987
	7	1.517*	.156	.000	1.013	2.021
	8	1.405*	.161	.000	.886	1.923
	9	1.208*	.166	.000	.672	1.744
4	1	-.657*	.175	.007	-1.221	-.093
	2	.623*	.159	.004	.110	1.137
	3	-.651*	.172	.007	-1.206	-.096
	5	-.405	.168	.598	-.946	.137
	6	.825*	.147	.000	.352	1.298
	7	.866*	.152	.000	.377	1.356
	8	.754*	.158	.000	.245	1.263
	9	.557*	.156	.014	.055	1.059
5	1	-.252	.195	1.000	-.881	.376
	2	1.028*	.168	.000	.485	1.571
	3	-.246	.172	1.000	-.800	.308
	4	.405	.168	.598	-.137	.946

	6	1.229*	.155	.000	.728	1.731
	7	1.271*	.168	.000	.729	1.812
	8	1.159*	.165	.000	.628	1.690
	9	.962*	.158	.000	.451	1.472
6	1	-1.482*	.169	.000	-2.028	-.935
	2	-.201	.144	1.000	-.665	.263
	3	-1.475*	.159	.000	-1.987	-.964
	4	-.825*	.147	.000	-1.298	-.352
	5	-1.229*	.155	.000	-1.731	-.728
	7	.042	.125	1.000	-.363	.446
	8	-.071	.129	1.000	-.488	.347
	9	-.267	.134	1.000	-.700	.165
7	1	-1.523*	.147	.000	-1.999	-1.048
	2	-.243	.126	1.000	-.648	.162
	3	-1.517*	.156	.000	-2.021	-1.013
	4	-.866*	.152	.000	-1.356	-.377
	5	-1.271*	.168	.000	-1.812	-.729
	6	-.042	.125	1.000	-.446	.363
	8	-.112	.123	1.000	-.509	.284
	9	-.309	.127	.557	-.718	.100
8	1	-1.411*	.157	.000	-1.916	-.906
	2	-.131	.139	1.000	-.578	.317
	3	-1.405*	.161	.000	-1.923	-.886
	4	-.754*	.158	.000	-1.263	-.245
	5	-1.159*	.165	.000	-1.690	-.628
	6	.071	.129	1.000	-.347	.488
	7	.112	.123	1.000	-.284	.509
	9	-.197	.139	1.000	-.644	.251
9	1	-1.214*	.166	.000	-1.750	-.678
	2	.066	.147	1.000	-.410	.542
	3	-1.208*	.166	.000	-1.744	-.672
	4	-.557*	.156	.014	-1.059	-.055
	5	-.962*	.158	.000	-1.472	-.451
	6	.267	.134	1.000	-.165	.700
	7	.309	.127	.557	-.100	.718
	8	.197	.139	1.000	-.251	.644

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	.443	30.725[a]	8.000	309.000	.000	.443
Wilks' lambda	.557	30.725[a]	8.000	309.000	.000	.443
Hotelling's trace	.795	30.725[a]	8.000	309.000	.000	.443
Roy's largest root	.795	30.725[a]	8.000	309.000	.000	.443

Each F tests the multivariate effect of Qualities. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

3. Year * Qualities

Measure: MEASURE_1

Year	Qualities	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Year two	1	3.071	.173	2.731	3.411
	2	1.768	.132	1.507	2.028
	3	3.065	.162	2.745	3.384
	4	2.548	.160	2.235	2.862
	5	2.910	.173	2.569	3.250
	6	1.690	.132	1.430	1.950
	7	1.619	.121	1.381	1.858
	8	1.574	.133	1.313	1.835
	9	1.710	.138	1.437	1.982
Year four	1	3.117	.169	2.785	3.448
	2	1.859	.129	1.605	2.113
	3	3.110	.158	2.799	3.422
	4	2.325	.156	2.019	2.631
	5	2.773	.169	2.441	3.105
	6	1.534	.129	1.280	1.787
	7	1.521	.118	1.289	1.754
	8	1.791	.129	1.537	2.046
	9	2.049	.135	1.784	2.315

4. Year

Estimates

Measure: MEASURE_1

Year	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Year two	2.217	.008	2.201	2.233
Year four	2.231	.008	2.215	2.247

Pairwise Comparisons

Measure: MEASURE_1

(I) Year	(J) Year	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
Year two	Year four	-.014	.012	.230	-.037	.009
Year four	Year two	.014	.012	.230	-.009	.037

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests

Measure: MEASURE_1

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	.015	1	.015	1.447	.230	.005
Error	3.341	316	.011			

The F tests the effect of Year. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

Regression analyses of goal relationships with spending towards Challenging quality

Descriptive Statistics

	Mean	Std. Deviation	N
Challenging	1.8219	1.64655	320
MAPmeans	5.5523	1.20919	366
MAVmeans	4.3560	1.52210	366
PAPmeans	4.4657	1.51440	366
PAVmeans	5.2549	1.44631	366

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PAVmeans, PAPmeans, MAPmeans, MAVmeans[b]	.	Enter

a. Dependent Variable: Challenging

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.160[a]	.025	.013	1.63571

a. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

b. Dependent Variable: Challenging

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.052	4	5.513	2.060	.086[b]
	Residual	842.795	315	2.676		
	Total	864.847	319			

a. Dependent Variable: Challenging

b. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.163	.535		4.042	.000
	MAPmeans	.062	.084	.045	.738	.461
	MAVmeans	.074	.069	.068	1.079	.282
	PAPmeans	-.019	.064	-.018	-.305	.761
	PAVmeans	-.175	.065	-.154	-2.674	.008

Coefficients[a]

Model		95.0% Confidence Interval for B		Correlations		
		Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	1.110	3.216			
	MAPmeans	-.103	.226	.047	.042	.041
	MAVmeans	-.061	.209	.044	.061	.060
	PAPmeans	-.144	.106	-.004	-.017	-.017
	PAVmeans	-.304	-.046	-.132	-.149	-.149

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	MAPmeans	.821	1.218
	MAVmeans	.769	1.301
	PAPmeans	.906	1.104
	PAVmeans	.936	1.069

a. Dependent Variable: Challenging

Regression analyses of goal relationships with spending towards Enthusiastic quality

Descriptive Statistics

	Mean	Std. Deviation	N
Enthusiastic	3.0997	2.13952	321
MAPmeans	5.5523	1.20919	366
MAVmeans	4.3560	1.52210	366
PAPmeans	4.4657	1.51440	366
PAVmeans	5.2549	1.44631	366

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PAVmeans, PAPmeans, MAPmeans, MAVmeans[b]	.	Enter

a. Dependent Variable: Enthusiastic

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.179[a]	.032	.020	2.11824

a. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

b. Dependent Variable: Enthusiastic

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	46.935	4	11.734	2.615	.035[b]
	Residual	1417.875	316	4.487		
	Total	1464.810	320			

a. Dependent Variable: Enthusiastic

b. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.779	.692		4.018	.000
	MAPmeans	.151	.108	.086	1.401	.162
	MAVmeans	-.189	.089	-.135	-2.133	.034
	PAPmeans	-.121	.082	-.086	-1.478	.141
	PAVmeans	.161	.085	.109	1.902	.058

Coefficients[a]

Model		95.0% Confidence Interval for B		Correlations		
		Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	1.418	4.141			
	MAPmeans	-.061	.364	.028	.079	.078
	MAVmeans	-.364	-.015	-.097	-.119	-.118
	PAPmeans	-.283	.040	-.093	-.083	-.082
	PAVmeans	-.006	.328	.079	.106	.105

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	MAPmeans	.821	1.218
	MAVmeans	.769	1.301
	PAPmeans	.906	1.104
	PAVmeans	.936	1.069

a. Dependent Variable: Enthusiastic

Regression analyses of goal relationships with spending towards Topic Expertise quality

Descriptive Statistics

	Mean	Std. Deviation	N
Expertise	3.0875	2.01837	320
MAPmeans	5.5523	1.20919	366
MAVmeans	4.3560	1.52210	366
PAPmeans	4.4657	1.51440	366
PAVmeans	5.2549	1.44631	366

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PAVmeans, PAPmeans, MAPmeans, MAVmeans[b]	.	Enter

a. Dependent Variable: Expertise

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.145[a]	.021	.009	2.00971

a. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

b. Dependent Variable: Expertise

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27.281	4	6.820	1.689	.152[b]
	Residual	1272.269	315	4.039		
	Total	1299.550	319			

a. Dependent Variable: Expertise

b. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.874	.657		2.850	.005
	MAPmeans	.194	.103	.116	1.892	.059
	MAVmeans	.004	.084	.003	.046	.964
	PAPmeans	.086	.078	.064	1.096	.274
	PAVmeans	-.050	.080	-.036	-.625	.533

Coefficients[a]

Model		95.0% Confidence Interval for B		Correlations		
		Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	.580	3.167			
	MAPmeans	-.008	.396	.127	.106	.105
	MAVmeans	-.162	.170	.059	.003	.003
	PAPmeans	-.068	.239	.088	.062	.061
	PAVmeans	-.208	.108	-.012	-.035	-.035

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	MAPmeans	.821	1.218
	MAVmeans	.769	1.301
	PAPmeans	.906	1.104
	PAVmeans	.936	1.069

a. Dependent Variable: Expertise

Regression analyses of goal relationships with spending towards Good Feedback quality

Descriptive Statistics

	Mean	Std. Deviation	N
Feedback	1.8840	1.72542	319
MAPmeans	5.5523	1.20919	366
MAVmeans	4.3560	1.52210	366
PAPmeans	4.4657	1.51440	366
PAVmeans	5.2549	1.44631	366

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PAVmeans, PAPmeans, MAPmeans, MAVmeans[b]	.	Enter

a. Dependent Variable: Feedback

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.134[a]	.018	.005	1.72083

a. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

b. Dependent Variable: Feedback

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.875	4	4.219	1.425	.226[b]
	Residual	929.834	314	2.961		
	Total	946.708	318			

a. Dependent Variable: Feedback

b. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.976	.564		1.731	.085
	MAPmeans	.111	.088	.078	1.261	.208
	MAVmeans	.027	.072	.023	.368	.713
	PAPmeans	.091	.067	.080	1.360	.175
	PAVmeans	-.044	.069	-.037	-.637	.525

Coefficients[a]

Model		95.0% Confidence Interval for B		Correlations		
		Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	-.134	2.085			
	MAPmeans	-.062	.284	.100	.071	.071
	MAVmeans	-.116	.169	.068	.021	.021
	PAPmeans	-.041	.223	.100	.077	.076
	PAVmeans	-.180	.092	-.011	-.036	-.036

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	MAPmeans	.821	1.218
	MAVmeans	.769	1.301
	PAPmeans	.906	1.104
	PAVmeans	.936	1.069

a. Dependent Variable: Feedback

Regression analyses of goal relationships with spending towards Interactive Teaching Style quality

Descriptive Statistics

	Mean	Std. Deviation	N
Interactive	1.5692	1.50915	318
MAPmeans	5.5523	1.20919	366
MAVmeans	4.3560	1.52210	366
PAPmeans	4.4657	1.51440	366
PAVmeans	5.2549	1.44631	366

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PAVmeans, PAPmeans, MAPmeans, MAVmeans[b]	.	Enter

a. Dependent Variable: Interactive

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.102[a]	.010	-.002	1.51086

a. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

b. Dependent Variable: Interactive

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.496	4	1.874	.821	.513[b]
	Residual	714.482	313	2.283		
	Total	721.978	317			

a. Dependent Variable: Interactive

b. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.044	.496		4.123	.000
	MAPmeans	-.069	.077	-.055	-.892	.373
	MAVmeans	.086	.064	.087	1.357	.176
	PAPmeans	-.013	.059	-.013	-.220	.826
	PAVmeans	-.078	.061	-.075	-1.284	.200

Coefficients[a]

Model		95.0% Confidence Interval for B		Correlations		
		Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	1.069	3.020			
	MAPmeans	-.222	.083	-.034	-.050	-.050
	MAVmeans	-.039	.211	.043	.076	.076
	PAPmeans	-.129	.103	-.009	-.012	-.012
	PAVmeans	-.197	.041	-.063	-.072	-.072

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	MAPmeans	.821	1.218
	MAVmeans	.769	1.301
	PAPmeans	.906	1.104
	PAVmeans	.936	1.069

a. Dependent Variable: Interactive

Regression analyses of goal relationships with spending towards Clear Presentation Style quality

Descriptive Statistics

	Mean	Std. Deviation	N
Presentation	2.8433	2.14869	319
MAPmeans	5.5523	1.20919	366
MAVmeans	4.3560	1.52210	366
PAPmeans	4.4657	1.51440	366
PAVmeans	5.2549	1.44631	366

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PAVmeans, PAPmeans, MAPmeans, MAVmeans[b]	.	Enter

a. Dependent Variable: Presentation

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.108[a]	.012	-.001	2.14969

a. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

b. Dependent Variable: Presentation

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.117	4	4.279	.926	.449[b]
	Residual	1451.046	314	4.621		
	Total	1468.163	318			

a. Dependent Variable: Presentation

b. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.822	.704		5.427	.000
	MAPmeans	-.201	.110	-.113	-1.825	.069
	MAVmeans	.077	.090	.055	.856	.393
	PAPmeans	.004	.084	.003	.051	.959
	PAVmeans	-.042	.086	-.028	-.485	.628

Coefficients[a]

Model		95.0% Confidence Interval for B		Correlations		
		Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	2.437	5.208			
	MAPmeans	-.417	.016	-.094	-.102	-.102
	MAVmeans	-.100	.255	.003	.048	.048
	PAPmeans	-.160	.169	-.010	.003	.003
	PAVmeans	-.211	.128	-.031	-.027	-.027

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	MAPmeans	.821	1.218
	MAVmeans	.769	1.301
	PAPmeans	.906	1.104
	PAVmeans	.936	1.069

a. Dependent Variable: Presentation

Regression analyses of goal relationships with spending towards Clear About How To Succeed quality

Descriptive Statistics

	Mean	Std. Deviation	N
Succeed	2.4295	1.98434	319
MAPmeans	5.5523	1.20919	366
MAVmeans	4.3560	1.52210	366
PAPmeans	4.4657	1.51440	366
PAVmeans	5.2549	1.44631	366

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PAVmeans, PAPmeans, MAPmeans, MAVmeans[b]	.	Enter

a. Dependent Variable: Succeed

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.155[a]	.024	.011	1.97296

a. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

b. Dependent Variable: Succeed

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.901	4	7.475	1.920	.107[b]
	Residual	1222.262	314	3.893		
	Total	1252.163	318			

a. Dependent Variable: Succeed

b. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.935	.646		2.993	.003
	MAPmeans	-.136	.101	-.083	-1.349	.178
	MAVmeans	-.025	.083	-.019	-.304	.761
	PAPmeans	.130	.077	.099	1.695	.091
	PAVmeans	.148	.079	.108	1.876	.062

Coefficients[a]

Model		95.0% Confidence Interval for B		Correlations		
		Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	.663	3.207			
	MAPmeans	-.335	.062	-.053	-.076	-.075
	MAVmeans	-.188	.138	.001	-.017	-.017
	PAPmeans	-.021	.281	.086	.095	.095
	PAVmeans	-.007	.304	.102	.105	.105

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	MAPmeans	.821	1.218
	MAVmeans	.769	1.301
	PAPmeans	.906	1.104
	PAVmeans	.936	1.069

a. Dependent Variable: Succeed

Regression analyses of goal relationships with spending towards Warm/Compassionate Personality quality

Descriptive Statistics

	Mean	Std. Deviation	N
Warm	1.6875	1.64836	320
MAPmeans	5.5523	1.20919	366
MAVmeans	4.3560	1.52210	366
PAPmeans	4.4657	1.51440	366
PAVmeans	5.2549	1.44631	366

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PAVmeans, PAPmeans, MAPmeans, MAVmeans[b]	.	Enter

a. Dependent Variable: Warm

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.149[a]	.022	.010	1.64023

a. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

b. Dependent Variable: Warm

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.292	4	4.823	1.793	.130[b]
	Residual	847.458	315	2.690		
	Total	866.750	319			

a. Dependent Variable: Warm

b. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.995	.537		3.718	.000
	MAPmeans	.029	.084	.021	.345	.730
	MAVmeans	.063	.069	.058	.914	.361
	PAPmeans	-.168	.064	-.155	-2.642	.009
	PAVmeans	.002	.066	.002	.028	.977

Coefficients[a]

Model		95.0% Confidence Interval for B		Correlations		
		Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	.939	3.050			
	MAPmeans	-.136	.194	.010	.019	.019
	MAVmeans	-.072	.198	.024	.051	.051
	PAPmeans	-.294	-.043	-.133	-.147	-.147
	PAVmeans	-.127	.131	.003	.002	.002

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	MAPmeans	.821	1.218
	MAVmeans	.769	1.301
	PAPmeans	.906	1.104
	PAVmeans	.936	1.069

a. Dependent Variable: Warm

Regression analyses of goal relationships with spending towards Reasonable Workload quality

Descriptive Statistics

	Mean	Std. Deviation	N
Workload	1.6219	1.64693	320
MAPmeans	5.5523	1.20919	366
MAVmeans	4.3560	1.52210	366
PAPmeans	4.4657	1.51440	366
PAVmeans	5.2549	1.44631	366

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PAVmeans, PAPmeans, MAPmeans, MAVmeans[b]	.	Enter

a. Dependent Variable: Workload

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.181[a]	.033	.020	1.63002

a. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

b. Dependent Variable: Workload

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28.300	4	7.075	2.663	.033[b]
	Residual	836.946	315	2.657		
	Total	865.247	319			

a. Dependent Variable: Workload

b. Predictors: (Constant), PAVmeans, PAPmeans, MAPmeans, MAVmeans

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.279	.533		4.275	.000
	MAPmeans	-.107	.083	-.079	-1.287	.199
	MAVmeans	-.133	.068	-.123	-1.942	.053
	PAPmeans	-.020	.063	-.018	-.312	.755
	PAVmeans	.115	.065	.101	1.765	.079

Coefficients[a]

Model		95.0% Confidence Interval for B		Correlations		
		Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	1.230	3.328			
	MAPmeans	-.271	.057	-.118	-.072	-.071
	MAVmeans	-.267	.002	-.135	-.109	-.108
	PAPmeans	-.144	.105	-.060	-.018	-.017
	PAVmeans	-.013	.243	.057	.099	.098

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	MAPmeans	.821	1.218
	MAVmeans	.769	1.301
	PAPmeans	.906	1.104
	PAVmeans	.936	1.069

a. Dependent Variable: Workload

Appendix 8

A response to Gavaza et al (2014) Article

THE UNIVERSITY OF SYDNEY

Faculty of Pharmacy

ABN 15 211 513 464

American Journal of Pharmaceutical Education

Attention: **Gayle A. Brazeau, PhD** , **Editor**

Dear Dr. Brazeau,

My colleagues and I would like to comment on a recent publication in the *American Journal of Pharmaceutical Education*. We have been researching the student motivation field for over fifteen years, and more recently focusing on pharmacy students' achievement goals (see our reference list attached). As such we would like to make some constructive comments about the methodology employed in the 2014 publication: "Measuring Achievement Goal Orientations of Pharmacy Students" by Gavaza, Muthart and Khan, which was published in *AJPE*, Volume (78), Issue (3), Article # 54. In this article, two validated achievement goal questionnaires are referred to: the Achievement Goal Questionnaire (AGQ), developed by Elliot and McGregor (A 2*2 achievement goal framework. *Journal of Personality and Social Psychology*, 2001: 80, 501-519), and the Revised Achievement Goal Questionnaire (AGQ-R), developed by Elliot and Murayama (On the Measurement of Achievement Goals: Critique, Illustration, and Application. *Journal of Educational Psychology*, 2008: 100(3), 613-628.

We comment as follows:

1- Gavaza, Muthart and Khan state that the survey administered to the students was based on the Achievement Goal Questionnaire (AGQ) and the Revised Achievement Goal Questionnaire (AGQ-R). This is not correct. Their survey comprises items solely from the AGQ-R. Furthermore, nine of the twelve items in their survey show some changes in wording compared to the original scale.
2- The Likert scale used in the Gavaza study is not the same as that used to validate the AGQ-R. The AGQ-R uses a 5-point scale, whereas Gavaza et al. used a 7-point scale to measure the AGQ-R items in their study. It should be noted that the AGQ employs a 7-point scale.

3- Gavaza et al. present data (mean and standard deviation) for the individual items of the AGQ-R. Individual items do not of themselves provide an accurate picture of achievement goal orientation. To gain a proper appreciation of the four achievement goal constructs, the relevant items would be better combined into a score for each goal. This would give the reader a much clearer idea about students' achievement goals.

4- In Table 1, item # 8 "I am striving to avoid performing worse than other students" is incorrectly labeled as a performance-approach item, when instead it is intended to measure the performance-avoidance construct.

Whilst these errors may not have altered the accuracy of the study findings, our research shows that the psychometric properties of these two scales are not equally sound when used in a pharmacy student population. We have conducted a validation study of the AGQ and the AGQ-R and have found that, contrary to the test developers' findings which were based on a non-pharmacy sample, the original scale is a better fit when used in a pharmacy student population. This we believe underscores the importance of accurately reporting methodology as much as the results of analyses.

We welcome further correspondence on this matter.

Kind regards,

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