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The Use of Speech Disfluency as an Indicant of Paradigm Development in Pharmacy's Academic Subdisciplines

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The Use of Speech Disfluency as an Indicant of Paradigm Development in Pharmacy's Academic Subdisciplines

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DEDICATION STATEMENT

To my parents- for their unrelenting patience and support

of my endeavors

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LIST OF ABBREVIATIONS

SAdS	Social and Administrative Sciences
PharmD	Doctor of Pharmacy
AACP	American Association of Colleges of Pharmacy
ACPE	American Council on Pharmaceutical Education
TAT	Thematic Apperception Test
IRB	Institutional Review Board
FNE	Fear of Negative Evaluation Scale
Brief-FNE	Brief Version of the Fear of Negative Evaluation Scale
PRCA-24	Personal Report of Communication Apprehension
ANOVA	Analysis of Variance
ANCOVA	Analysis of Covariance
STAI	State-Trait Anxiety Instrument

I. INTRODUCTION

A. The evolution of academic disciplines

The current landscape of higher education is the result of a profound transformation in its nature and scope over the last two centuries. One of the driving forces behind this change has been the differentiation of academic disciplines.[1] In the early nineteenth century, colleges and universities instructed only a few elite students in a small number of basic subjects like classical languages, mathematics, natural and moral philosophy. These subjects were considered to be the foundation for students' clerical and "gentlemanly" pursuits.[1] Having received training similar to that of their protégés, 19th century professors were relatively unspecialized themselves, and primarily focused their efforts on teaching rather than scholarship.[1,2] Today, colleges and universities offer instruction in hundreds of specialized fields, while fostering disciplinary differentiation even further by encouraging faculty to become adept at research as well as teaching.[1,3-4] Just as disciplines rapidly proliferated, so too did the controversy surrounding these transitions. In the early 1900s, the growing number of academic disciplines raised concerns about the integrity of higher education. To some, disciplinary specialization translated into "scholarly disintegration" of American academics and a decline in the standards of intellectual excellence.[1,5] These concerns brought forth a long-standing debate as to whether there existed many "academic professions" or only one,[1,6-7] and whether universities existed as coherent organizations.[1,8-9]

B. Early studies of paradigm development

The differentiation of formerly unspecialized disciplines into newer, more specialized disciplines has served as the impetus for examining the issue of scholarly

development or "progress." Subsequently, twentieth century philosophers have attempted to explain why some academic disciplines seem to advance more quickly than others.[10] In the 1950's scholars used dichotomous conceptualizations such as theoretical versus empirical,[11] restricted versus unrestricted,[12] and mature-effective versus immature-ineffective[13] to characterize academic disciplines in the absence of empirical data. The most significant of these was Kuhn's conceptualization of pre-paradigmatic and paradigmatic disciplines to more specifically address issues of progress in academic disciplines. Kuhn's concept of *paradigm development*, or "the degree of consensus or sharing of beliefs within a scientific field about theory, methodology, techniques and problems,"[14] described not only the accepted theory and findings of a field, but also its structure, by suggesting which problems require investigation, what methods are appropriate to their study, what findings are considered "proven," and what basic principles within the field of knowledge should be taught to undergraduate and graduate students.[15] Kuhn speculated that the social sciences (e.g. sociology and psychology) were in their pre-paradigmatic stage, while the physical sciences (e.g. physics and chemistry) had attained scientific paradigm.[14] While Kuhn's work was persuasive and well accepted by scholars, it lacked empiric foundation.

In 1973, Anthony Biglan published his landmark study employing a multidimensional scaling technique to analyze judgments of discipline similarity made by faculty representing 36 disciplines. Biglan identified three dimensions (hard/soft, pure/applied and life/non-life) that he subsequently found to be highly predictive in determining scholars' social connectedness, commitment to teaching and scholarship, and scholarly productivity.[16-17] The identification of the "hard-soft" dimension corroborated

Kuhn's conceptualization of pre-paradigmatic and paradigmatic disciplines. Of particular interest are the differences Biglan uncovered in the "hard" disciplines such as the physical sciences and engineering and "soft" disciplines such as the humanities and education. Specifically, he found that scholars in "harder" disciplines prefer to collaborate with colleagues in teaching and research activities, prefer research activities and devote more to time to research while the "softer" areas prefer teaching activities, and scholars in "harder" areas publish more journal articles and fewer monographs than scholars in the softer disciplines. Researchers since Biglan have operationally defined basic social sciences and humanities as low consensus disciplines while defining physical and environmental sciences as high consensus disciplines without overtly measuring these constructs. Subsequently, evidence of overwhelming differences existing between the social and physical sciences continues to mount. Recent attention has turned more specifically to studying the ramifications of disciplines' progress toward scholarly consensus, including the acquisition of resources, journal rejection rates, optimism about the discipline, and even faculty salaries.[1]

C. Paradigm development and pharmacy

While studies have thoroughly examined the practical implications of disciplinary progress in the social and basic sciences, they have fallen short of adequately addressing progress in professional domains like medicine, law, and pharmacy.[18] A lack of consensus on research priorities in medicine has been attributed to a wide variation in the peer review systems of medical journals.[19] Additionally, a lack of consensus has been documented on a core knowledge for practicing nurses.[20] Pharmacy as a discipline, with its newer and applied subdisciplines of medicinal chemistry, pharmaceutics,

pharmacology, pharmacy practice, and the social and administrative sciences (SAdS), lends itself well to an examination of disciplinary progress. Because pharmacy's academic subdisciplines tend to borrow from older, more established disciplines, they may not have fully developed scientific paradigms.[18]

The development of subdisciplines in pharmacy education has been a function of changes in the pharmacy profession over the last three centuries.[21] Following the industrialization of pharmacy wholesalers into mass producers of prefabricated drug products, pharmacy education transitioned to a greater use of "theoretically organized scientific paradigms,"[21] hence dubbing pharmacy education in the mid to late 1900s as the "science era."[22] Medicinal chemistry first evolved from descriptive pharmaceutical chemistry. Next came pharmacology, a subdiscipline whose tenet was to organize instruction in other courses.[23] Pharmaceutics was then developed through the integration of physical chemistry into pharmacy education. The industrialization of pharmacy practice lessened the need for pharmacy faculty whose primary interest was pharmacy practice, hence, pharmacy administration and disciplines associated with practice faded during this period.[21] As such, SAdS were founded on theories borrowed from disciplines like psychology, anthropology, economics, and marketing,[24] Interestingly, these disciplines have already been demonstrated to be "softer" or less structured in nature than basic sciences. In short, by adopting theories from other disciplines in the evolution of pharmacy education, subdisciplines may have failed to develop a consensus within their own ranks on key issues such as the most appropriate course content for entry-level students, the most important topics to research, and the best methods by which to research them.[18]

D. Studies of paradigm development in pharmacy

While the need to develop a consensus on a vision of teaching, research, and practice in pharmacy has been acknowledged for over a decade,[25] researchers have just begun to address the issue of paradigm development within pharmacy's subdisciplines. A recent study attempted to measure perceived consensus among pharmacy faculty as an initial step in determining progress toward achieving their scientific paradigms.[18,26] Specifically, Desselle and colleagues sought to measure perceptions of consensus existing within the subdisciplines on issues dealing with the instruction of entry-level degree program students, scholarship, organizational structure and reward systems, and implementation of a graduate programs. Additionally, attempts were made to compare rankings of the five subdisciplines' progress toward achieving their scientific paradigms as perceived by pharmacy academicians. Finally, the authors qualitatively assessed what subdiscipline members believed to be the most important concepts that they teach to entry-level students, and what they believed to be most important research issues for their discipline members.

Study findings demonstrated that while the subdisciplines perceived at least modest agreement on consensus constructs, pharmacy practice perceived less consensus, particularly with respect to graduate programming. When asked how they perceive the level of agreement on teaching and scholarship in one's own subdiscipline relative to that of other disciplines at their institution, academicians' quantitative responses were similar across disciplines. Pharmacy practice, however, exhibited less accord on what constitutes good scholarship. Pharmacy scholars' mean rankings afforded to the disciplines in achieving their scientific paradigms were significantly higher for medicinal chemistry,

pharmacology, and pharmaceutics as compared to pharmacy practice and SAdS. In other words, respondents felt that the former disciplines have developed more structured paradigms. This may suggest that pharmacy scholars perceive pharmacy practice and SAdS to be lagging behind the other three disciplines studied, a perception that may be mitigated through SAdS and pharmacy practice scholars' promotion of the valuable research contributions they make.[18] Finally, when asked to identify what issues/concepts are most important to teach entry-level students and what issues/problems are most important to research, pharmacy practice and the social and administrative sciences demonstrated less focused teaching and research agendas than did their colleagues in medicinal chemistry, pharmacology, and pharmaceutics.

Presumably, medicinal chemistry, pharmacology, and pharmaceutics would be "harder" sciences than pharmacy practice and SAdS.[18] These study results suggest, however, that perceptions of consensus with colleagues did not differ greatly from one discipline to another with the exception that pharmacy practice faculty reported somewhat less accord on certain graduate program issues. Because most SAdS scholars have been trained in their own rigorous research programs concomitantly with members of the basic sciences in a school of pharmacy while holding an undergraduate degree in pharmacy, the gap between they and the basic scientists along the "hard-soft" dimension may not be as great as that which exists between social scientists and physical scientists not affiliated with professional degree programs. The highly specialized training received by pharmacy practice faculty in residency and fellowship programs may account for discrepancies in disciplinary consensus among pharmacy practice faculty.[18]

E. Importance of paradigm development in the pharmacy disciplines

Findings of these preliminary studies demonstrate that further assessment of consensus on teaching and research issues within pharmacy's academic subdisciplines are critical to the vitality of pharmacy education. Colleges and schools of pharmacy have responded to the profession's embracing a new practice philosophy by transitioning their curriculum to accommodate the Doctor of Pharmacy (PharmD) as the entry-level degree.[26] This current state of flux in pharmacy education concomitant with the dynamics of health policy necessitates continuous updates and revisions to pharmacy curricula. Most notably, preparing pharmacy students for practice in a dynamic healthcare environment requires an interdisciplinary curriculum developed through the collaborative efforts of scholars in all subdisciplines. Such efforts toward multi- and interdisciplinary collaboration have been documented.[27] The American Association of Colleges of Pharmacy (AACP), an organization representing the faculty members and deans of colleges and schools of pharmacy nationwide, has dedicated annual meetings and published documents aimed at accomplishing this endeavor.[28] Perhaps the most apparent and extensive efforts to achieve an interdisciplinary approach in education is the development of disease-based, integrated-design courses reflective of the recent transition to the entry-level PharmD program.[29-38] Interdisciplinary courses, typically including material from pathophysiology, pharmacology, medicinal chemistry, pharmaceutics, clinical therapeutics, and most recently SAdS, are designed with the intent of developing pharmacy professionals with the ability to synthesize, evaluate, and incorporate new information in the clinical decision-making process for which they will be increasingly involved.[29,33,35-37]

To meet these objectives through an interdisciplinary approach necessitates that scholars in the courses' faculty teams first have an understanding and a healthy respect for their counterparts' goals and priorities for educating future practitioners and advancing the profession.[26] Accordingly, it has been argued that to make interdisciplinary professional pharmacy curricula more viable, there must be agreement on domains or content areas that must be mastered by students.[39] Although studied outside of pharmacy, Salancik, Staw, and Pondy supported this argument in finding that the conflict arising from task interdependence associated with intra- and interdepartmental collaboration was mitigated by consensus within departments on the coordination of tasks.[40] Although the goals of interdisciplinary collaboration are well-intentioned, the profession may not be able to reap the benefits of these efforts until the state of consensus within each subdiscipline is thoroughly examined.[26]

Collaborative efforts aside, it is possible that subdisciplines demonstrating low consensus and less focused teaching agendas may produce graduates entering the pharmacy profession with varying levels of competence within that particular subdiscipline, even in spite of oversight by the American Council on Pharmaceutical Education (ACPE).[41] The importance of achieving consensus in pharmacy's subdisciplines has been recognized. It has been suggested that in order for pharmacy to move into the mainstream of current and future national health care initiatives, it must achieve basic agreement on teaching and research priorities.[42]

A discipline's inability to achieve paradigmatic development results in a highly interwoven set of consequences that jeopardize not only the goals of teaching, but also its vitality as a science.[26] Having fallen short of achieving its paradigm, the discipline's

constituent members fail to agree upon basic principles to guide their scholarly efforts. Scientists in low consensus disciplines may spend inordinate amounts of time re-testing the same hypotheses and exhaust considerable effort to convince their peers of the rationale for their inquiries and the methodological approaches that they employ.[26] This is commonly observed in the literature of low-consensus fields wherein authors of peer-reviewed journal articles dedicate more space to "establishing the literature."[43] This translates into higher rejection rates and greater degrees of particularism within journals of low-consensus fields.[44-46] Thus, it is not surprising to learn that scholars in low consensus fields are less productive than those in high-consensus fields and are subsequently more prone to feelings of stress, pessimism, and anomie.[26,47-49] Additionally, it may be difficult for low consensus disciplines to capture intra- and extramural funding if they consistently demonstrate less-focused research agendas. This has been empirically demonstrated in disciplines outside of pharmacy, as scholars in low consensus disciplines have been found to attain less funding than their high consensus counterparts.[50]

Compromised productivity is especially problematic as scholarship contributes to the body of knowledge, results in the scholar remaining abreast of new developments through the publication of research results, and enables him or her to attain recognition from colleagues.[26,51-52] The importance of productivity has been specifically addressed within the discipline of pharmacy itself through organizational policy. The ACPE in Guideline 25.2 of its Accreditation Standards and Guidelines for the Professional Program in Pharmacy Leading to the Doctor of Pharmacy Degree states "Faculty should have a responsibility to generate and disseminate knowledge through scholarship, . . . and

. . .The College or School should foster an environment which encourages contributions by the faculty to the development and transmission of new knowledge, and should contribute to the advancement of knowledge and to the intellectual growth of students through scholarship."[41]

Just as teaching and scholarship are susceptible to the effects of consensus, having achieved consensus or "scientific progress" has implications in how faculty members view teaching and research and ultimately how they handle stress and adjust to their roles.[1] Faculty members' management of stress and role adjustment is critical in a time when advances in technology and the consumerism movement are fueling a more commercialized academic environment.[53] With innate pressures related to competition for funding and university tenure systems, faculty are facing increasingly heightened expectations to rapidly produce scholarly works.[53] It has been suggested that performance expectations and stress levels of faculty are increasing while morale is decreasing.[53] Pharmacy faculty are particularly susceptible to these trends, given the constant flux of entry-level curricula.[26] Additionally, new pharmacy faculty members are challenged by the requirement of attaining at least some level of understanding of pharmacy's other disciplines, each of which are unique in their maturity, their application of pure versus applied, or biological versus non-biological science.[54] This may be exceptionally problematic for those new faculty members not formally trained as pharmacists, but as social or basic scientists.[54] There is evidence to suggest that new faculty in high-consensus disciplines are better able to acclimate to their teaching and research roles than their colleagues in low-consensus disciplines.[55] The challenges that pharmacy faculty face when first acclimating to their new faculty roles have been

extensively documented in a recently published collection of personal insights on the obstacles that new faculty encounter.[54] This lends further credence to assessing the level of consensus maintained by each discipline, and making efforts to progress toward scientific paradigm if it is compromised.

Preliminary findings suggest differing levels of paradigm development among pharmacy's academic subdisciplines, and warrant further examination into progress made by each.[18,26] The well-documented implications of consensus (or lack of consensus) on scholarly productivity, faculty-role adjustment, acquisition of resources, and faculty salary further merits continued examination into pharmacy's subdisciplines. Whether further analysis of paradigm development within pharmacy disciplines reveals trends similar to those uncovered by Desselle and colleagues remains to be found. If further evidence demonstrates that a disparity in paradigm development among the subdisciplines indeed exists, determining the ramifications of this disparity upon scholarly productivity and other phenomena is warranted. Subsequent efforts may be made by institutions, pharmacy schools, disciplinary departments, and accrediting bodies to address the implications of low consensus on scholarship and productivity. If further research does not support the finding of differing levels of consensus, efforts may then focus on determining the causes of differing levels of productivity among subdisciplines with efforts made to address these disparities.

F. Statement of the problem

Numerous studies have been conducted to assess paradigm development and explore the ramifications of consensus on teaching and scholarship in scientific disciplines. Studies published after Biglan's work,[16-17] however, have fallen short of actually operationalizing the construct of consensus. Rather, they have simply inferred and thus operationally the physical sciences, mathematics and engineering as high-consensus disciplines, and the social sciences and humanities as low-consensus disciplines. Few attempts have been made to categorize a more comprehensive set of disciplines since Biglan's 36 fields of study.[16]

Seeking to address these issues, Desselle and colleagues operationalized the consensus construct through instrumentation designed to measure consensus among pharmacy's five academic subdisciplines.[18,26] The methods utilized to measure consensus within pharmacy's academic subdisciplines, in part, measured perceptions of consensus as proxy of the consensus construct itself. While such methods have been previously validated[5] there is concern that some respondents may provide socially desirable answers. The potential for bias warrants the use of an alternative and more direct measure of the consensus construct.

Evidence of compromised paradigm development within a discipline is present within the language of its constituent members. In addition to the difficulties encountered when submitting manuscripts to refereed journals, these scholars face additional challenges when trying to communicate their ideas in the classroom.[56-58] Having a greater number of choices and a less straight-forward way to convey ideas, scholars in low-consensus disciplines exhibit a greater number of speech disfluency

patterns in the classroom, for example, the use of “uh’s,” “ah’s,” repeats, restarts, and extended pauses.[56-58] The prevalence of speech disfluency patterns, specifically filled pauses such as “uh”, “er,” “um” during course lectures is a measure that has been demonstrated to be a valid indicant of consensus among different scientific disciplines.[59] By measuring speech disfluency occurring in lectures to professional pharmacy students, an attempt was made to compare the level of paradigm development among pharmacy’s academic subdisciplines.

G. Purpose and objectives of study

The purpose of this study is to compare the level of consensus within five subdisciplines of pharmacy including medicinal chemistry, pharmaceutics, pharmacology, pharmacy practice, and SAdS. The specific objectives of this study are to:

(1) Compare speech disfluency rates in lectures of entry-level pharmacy courses within five subdisciplines of pharmacy as a means of estimating their paradigm development, and

(2) Determine the relationship between speech disfluency rates and the following:
    a. Instructors' level of anxiety,
    b. Instructors' fear of being negatively evaluated by their students,
    c. Instructors' cumulative years of teaching experience,
    d. Number of times instructors have taught observed courses,
    e. Demographic characteristics of instructors (age, gender, native language),
    f. Institution from which the sampled course is taught, and
    g. Instructors' undergraduate degree (pharmacy or non-pharmacy)

II. CONCEPTUAL FRAMEWORK

A. The use of theoretical frameworks to describe disciplinary differences

The last 50 years have ushered in a wealth of empirical work examining the structural composition of academic disciplines. Much of this research is predicated upon theoretical frameworks developed from anecdotal observations of disciplines' "progress" in achieving scientific breakthroughs. The idea that some scholarly fields are more "fundamental" than others dates as far back as fourth century B.C. when Aristotle established criteria for ranking fields on this criterion.[1,60] As disciplines proliferated in the 18th and 19th centuries, philosophers developed additional classifications for differentiating academic fields.[1] The most significant of these was Comte's hierarchical ranking of disciplines along a general-simple to specific-complex dimension.[1,61] Twentieth century philosophers became increasingly focused on understanding why some disciplines "progress" faster or advance more quickly than others.[10] Beginning in the 1950's scholars used dichotomous conceptualizations such as theoretical versus empirical,[11] restricted versus unrestricted,[12] and mature-effective versus immature-ineffective[13] to differentiate academic disciplines.

Of particular interest was Kuhn's attempt to address the degrees of progress made in various academic disciplines by distinguishing between pre-paradigmatic and paradigmatic disciplines. The foundation of Kuhn's endeavor lied in his concept of "paradigm development," or the degree of consensus or sharing of beliefs within a scientific field about theory, methodology, techniques, and problems."[14] Kuhn described scientific paradigm as including not only the accepted theory and findings of a field, but

also its structure, by suggesting which problems require investigation, what methods are appropriate to their study, and even which theories are considered "proven."[15] In other words, Kuhn's concept of paradigm development considered whether a discipline's members conceded on prioritizing problems that required investigation, utilizing appropriate methodologies to investigate research questions, and using underlying theory that is widely agreed upon and proven accepted by a majority. Kuhn speculated that the social sciences such as sociology and psychology were in their pre-paradigmatic stage, while the physical sciences such as physics and chemistry had achieved their scientific paradigm.[14] Although Kuhn's work was logical, persuasive, and well accepted by scholars, it suffered from a lack of empirical foundation.

It appears that Kuhn's conceptualization has influenced theoretical characterizations of disciplines by more recent scholars. In the 1980s, Becher attempted to conceptualize the major dimensions of variation among disciplines.[62-64] Mapping his conceptualization after that of Kuhn's, Becher argued that disciplines need to be classified by not only their subject matter, but also their social structure. Becher identified two dimensions of disciplinary social structure. Of particular interest was his identification of the "convergent-divergent" continuum. Becher contended that members of convergent fields have a strong sense of identity corresponding with an "impermeable intellectual boundary" whereas divergent field members differ about the nature and goals of their field, and demonstrate a readiness to adopt ideas and techniques from other fields. As recently as 1993, Silverman described scholarly communities similarly to Becher by describing not only a discipline's knowledge base, but also its social structure.[65] Silverman distinguished between "regulative" and "constitutive" disciplines. He

contended that regulative scholars' activities are shaped by at least tacit agreement on research questions that merit investigation and the methodological means for answering those questions. Consequently, these disciplinary communities recognize that some members make greater contributions to the body of knowledge than do others. By contrast, constitutive scholars demonstrate less agreement on scholarly issues, and tend to consider each other as peers with equally important contributions to scholarship.

B. Empirical assessment of disciplinary consensus

It was not until the 1960s that scholars began to empirically examine the nature of differences among academic disciplines. In 1973, Biglan published a landmark study that employed a multidimensional scaling procedure to analyze judgments of discipline similarity made by faculty representing 36 distinct areas of study.[16] Biglan identified three dimensions which best serve to characterize a specific field. The first was a "hard-soft" dimension whereby physical sciences and engineering lay at the "hard" end of the continuum while the social sciences lay towards the middle, and the humanities and education disciplines lay at the "softer" end. The second dimension identified as "pure" versus "applied" found philosophy, languages, mathematics, and the social and physical sciences to be pure disciplines while areas such as accounting, finance, and engineering aligned on the end of the continuum concerned with the practical application of subject matter. The third dimension addressed whether the area was concerned with living or organic objects of study, with agriculture, biology, sociology, and education aligning on one end of the dimension, and areas such as mechanical engineering, mathematics, computer science, and physics on the other.

Of particular interest is Biglan's identification of a "hard-soft" dimension, as it appears to empirically support Kuhn's conceptualization of pre-paradigmatic and paradigmatic disciplines. For example, the physical sciences such as physics and chemistry that lay at the "hard" end of the Biglan's "hard-soft" continuum were the same disciplines that Kuhn designated to have achieved paradigmatic development. Likewise, the humanities and education that were found to lie at the "soft" end were the same disciplines that Kuhn described to be pre-paradigmatic. Finding the social sciences such as sociology and psychology to lie closer to the middle of the "hard-soft" continuum, Biglan proposed that these fields strive to attain a paradigm, but have yet to achieve one.

Biglan subsequently found the hard-soft, pure-applied, and life-non-life dimensions to be highly predictive in determining scholars' social connectedness, commitment to teaching and scholarship, and scholarly productivity.[17] For example, scholars in "hard" areas reported greater collaboration in teaching and scholarly activities than did their "soft" area counterparts. Scholars in "hard" areas demonstrated significantly greater preference for research activities, while those in "soft" areas demonstrated more commitment to teaching activities. Additionally, scholars in hard areas were found to produce fewer monographs and more journal articles than those in the "soft" areas.

By corroborating his findings with Kuhn's conceptualization, Biglan suggested that paradigmatic development allows a discipline to attain a level of socialization and scholarly productivity that it otherwise would not attain. By sharing a common theoretical framework, collaboration by members of harder disciplines will not be hindered by differences in orientation. By contrast, scholars in softer disciplines must

establish a common ground on research problems before they can begin to collaborate. Interestingly, Biglan found that a discipline's level of socialization is more positively related to output in the "hard" disciplines that the "soft" disciplines, suggesting that "hard" disciplines may *require* a certain level of social connectedness for productivity that the "soft" disciplines do not.[17] Based on his findings, Biglan suggested that collaboration in the "soft" disciplines may actually be detrimental to scholarly productivity if scholars fail to agree on the means to address research problems. Biglan's findings corroborate those by Menzel who demonstrated that colleagues of the "hard" discipline scholar enhance that scholar's productivity by providing him or her with important technical information relevant to work in that paradigm.[66]

In the 1970s, Lodahl and Gordon suggested that the high level of consensus found in paradigmatic disciplines not only provides for an accepted and shared vocabulary for discussing the content of the field, but provides for an accumulation of scientific findings on what has been successful in the past. As a result, Lodahl and Gordon proposed that the advantages of a superior communication process and information inventory should be evident in all scientific tasks that involve communication and decision-making.[15] From this, they developed a series of hypotheses in which relatively high paradigm development in a discipline was predicted to facilitate research and teaching through an improved process of communication and greater access to published information.[15] Before testing these hypotheses, however, Lodahl and Gordon sought to test Kuhn's contention that paradigms are more highly developed in the physical sciences than the social sciences. Respondents were asked to rank disciplines according to their level of paradigm development and were asked to indicate the amount of agreement that their

disciplines demonstrate on undergraduate course content and graduate degree requirements. As predicted, physicists and chemists demonstrated a higher level of consensus than political scientists and sociologists, supporting Kuhn's concept of paradigm development.

Lodahl and Gordon found that physicists and chemists were more willing to spend time with graduate students and placed more value on time spent with those students. The authors attributed their findings to graduate students in the social sciences requiring more supervision from their faculty advisors. This may be because social science graduate students study a wide range of competing and often conflicting theories and methodologies. As a result, students and their advisors must expend greater effort in rationalizing the choices they make over the methodology used to address research problems. Lodahl and Gordon suggested that because physical science faculty demonstrate greater agreement over course content, it is likely that graduate students and faculty demonstrate similar agreement, making the use of teaching and research assistants more efficient and thus more prevalent in high-paradigm fields. Indeed, scholars in physics and chemistry reported greater use of teaching and research assistants after the authors controlled for the amount of financial support available to these disciplines for hiring research assistants. Finally, chemists were found to collaborate in research endeavors with larger numbers of fellow scholars than were scientists in other fields. Lodahl and Gordon attributed this trend to social scientists expending more effort in reaching agreement over many research decisions. If this process becomes too difficult, collaboration may no longer be advantageous to social scientists.

Since Biglan's landmark work, researchers have attempted to determine whether everyday academic practice varies across scholarly disciplines.[1] In doing so, they have operationally defined social sciences and humanities as low consensus disciplines while defining physical and environmental sciences as high consensus disciplines without overtly measuring these constructs. Subsequently, evidence of overwhelming differences existing between the social and physical sciences continues to mount.

C. The effects of disciplinary consensus on teaching

While the emphasis placed on teaching varies across institutions, it remains one of the core activities of the academic profession.[67] Recent studies of the effects of disciplinary consensus have focused on teaching preferences and goals, classroom practices, teaching norms, evaluations of teaching performance, and adjustment to the faculty role. After identifying a hard-soft" continuum to describe academic disciplines, Biglan reported that faculty in low-consensus or "soft" disciplines prefer teaching activities more than faculty in high-consensus fields; he and others have found that their time commitments to teaching reflect this preference.[17,68] Given these findings, it is not surprising that scholars in low-consensus disciplines are more likely to agree that teaching should be the most important criterion for promotion.[69] Despite the fact that scholars in low-consensus disciplines are more committed to teaching, they have reported significantly less agreement within their own ranks about *what* to teach as compared to their colleagues in high-consensus disciplines. Specifically, Lodahl and Gordon found that physics scholars reported more agreement over the content of undergraduate courses than political science scholars, and both physics and chemistry scholars reported more agreement over the content of graduate coursed than did sociology faculty.[15]

A number of differences in classroom teaching styles among high- and low-consensus discipline scholars have been documented. Faculty in high-consensus fields are more likely to use teaching assistants in the classroom and participate in collaborative teaching than low-consensus fields, presumably because these practices are more easily fostered in a discipline whose constituents agree on course content and teaching methods.[15,17] Gaff and Wilson reported that faculty in low-consensus disciplines are more likely than those in high-consensus disciplines to use not only a "student-centered" approach but a "discursive" approach- for example, they are more likely to discuss points of view other than their own, more likely to discuss issues beyond those covered in course readings, and more likely to relate course topics to other fields of study.[70] More recently, Braxton reported that faculty in low-consensus fields are more likely to lecture on topics derived from current scholarly books, assign research activities, provide current journal articles as required course readings,[71] ask examination questions requiring analysis, synthesis, and critical thinking,[72] and prefer that students play a leading role in selecting courses that meet their own degree requirements.[73]

Scholars in low-consensus disciplines have been found to exhibit an affinity for enacting teaching activities and practices designed to improve undergraduate education because they value student character development,[74] stress the development of critical-thinking skills, employ student-centered teaching practices, and favor the use of program review and student assessment to improve teaching and learning more than their high-discipline colleagues do.[75] Moreover, they place greater emphasis in providing a broad educational experience and addressing students' growth needs, preparation, and interest

than do their colleagues in high-consensus disciplines who have been found to place greater importance in career preparation.[70,76]

Presumably, the emphasis that faculty in low-consensus disciplines place on student development may explain the higher ratings they receive on teaching evaluations compared to their high-consensus counterparts.[77,78] Attributing teaching evaluation ratings to disciplinary differences may be especially noteworthy given the consensus across all disciplines on what practices constitute good teaching: enthusiasm for teaching, knowledge of the subject matter, concern about student growth and development, fair tests and frequent feedback, and clear statement of course objectives.[1,79] It is important to note, however, that while their teaching goals and styles may differ, faculty in high- and low-consensus disciplines demonstrate similar allegiance to norms about interpersonal disregard, inadequate course planning, particularistic grading, and moral turpitude.[1,80] In other words, scholars in both types of disciplines have been shown to assign similar ratings of inappropriateness to behaviors such as disregarding the opinions of students and colleagues, awarding grades unfairly, engaging in sexual relationships with students, and arriving to class unprepared.[80]

Recently, Braxton and Berger sought to investigate the advantages or disadvantages that disciplinary consensus creates for new faculty in their adjustment to the professorial role.[55] The authors hypothesized that new faculty in high-consensus disciplines are more advantaged with respect to factors important to research role performance, while their low-consensus counterparts accrue more advantages pertinent to the teaching role of new faculty. The hypotheses were based on the conclusions of an extensive review of empirical research that faculty in high-consensus fields are more

oriented to research than low consensus fields.[1] Surprisingly, findings demonstrated that faculty in high-consensus disciplines are better able to adjust to their new research *and* teaching roles than are their low-consensus discipline counterparts. The findings of this study did not support the authors' initial hypothesis, but do suggest an important conclusion. It appears that new faculty in high-consensus fields are better able to acclimate to the prevailing role expectations of their employing institution than are their low-consensus discipline colleagues.

Similarly, the existence of complimentarity between teaching and research roles has been an issue of debate among researchers.[81] While there is argument as to whether the two roles are reinforcing or conflicting,[82] it appears that consensus mediates these relationships. Feldman found that teaching performance and scholarly productivity have a moderate (r=0.21) relationship in low-consensus fields, but an insignificant relationship (r=0.05) in high-consensus fields.[83] In other words, research productivity and teaching effectiveness are more strongly related (positively) in low-consensus fields, but unrelated in the high-consensus fields. While a number of hypotheses have been made to explain these findings, the most plausible argument has been posed by Michalak and Friedrich, suggesting that "research in the natural sciences, in contrast to research in the social sciences and humanitities, may be at a level of abstraction and complexity that renders it of little utility in the classroom."[84]

D. The effects of disciplinary consensus on scholarship

Recent attention has turned towards studying the evidence and ramifications of disciplinary consensus on scholars' orientation towards research, scholarly communication and productivity, citation practices, journal rejection rates, and the role of

collaboration and social support in scholarship. Biglan first reported on the effects of disciplinary consensus on scholarship when finding that faculty in high-consensus fields expressed a greater preference for doing research than faculty in low consensus fields.[17] Later research substantiated Biglan's earlier findings by demonstrating that scholars in high-consensus disciplines commit more of their time to research activities.[68,85] It follows, then, that scholars in high-consensus disciplines agree that research should be the primary criterion for promotion and tenure.[69]

These findings may be a result of the prevailing condition in low-consensus disciplines that make accomplishment in the research arena more difficult. As basic tenets in low-consensus disciplines have not been unequivocally adopted, scholars may have to spend inordinate amounts of time continuously testing and retesting various assumptions rather than spending this time pursuing novel research interests.[18] Accordingly, scholars in low-consensus disciplines demonstrate less agreement on the standards of good scholarship within their disciplines, and report more fundamental differences about the nature of their discipline, than do scholars in the high-consensus disciplines.[86] Perhaps this explains why aspiring scholars in low-consensus disciplines devote more time to completing their doctoral degrees,[87] and why their advisors prefer to work with fewer graduate students than their colleagues in high-consensus disciplines.[17]

Evidence suggests that communication among scholars in low-consensus disciplines may be more arduous than that among scholars in high-consensus disciplines. Dissertations in low-consensus disciplines have been found to be substantially longer than those in high-consensus disciplines in order to accommodate for describing and justifying research, delimiting methodological approaches and evaluating problems,

[47,62,88] while dissertations in high-consensus disciplines are imbued by greater precision through quantitative evidence and a common understanding of theories and methods in the subject area.[17,89] In part, this may be attributed to low-consensus discipline articles devoting substantially more space to establishing the literature.[43] It appears that the relative barriers scholars in low-consensus disciplines encounter when communicating extends the boundaries of their own institutions. For example, these scholars have been less likely to report research results at scientific meetings prior to publication and are less likely to distribute preprints to colleagues.[90] There is some evidence to suggest that high-consensus disciplines have more structured mechanisms in place to facilitate dissemination of findings though preprints and scientific meetings, making it easier for them to distribute their finding prior to publication.[90] Additionally, a smaller proportion of papers presented at meetings are eventually published in low-consensus fields compared to high-consensus fields.

Studies examining the citation patterns of high- and low-consensus disciplines have demonstrated that authors in low-consensus fields tend to cite older literature and "classic" works by disciplinary founders, and integrate research around "charismatic documents" rather that recent research developments.[91-93] Accordingly, scholars in low-consensus fields are also more likely to publish their own results in book form.[94] The way in which authors cite peer-reviewed articles also varies across disciplines. In a comparative study of how authors cite a sociology and neuropharmacology paper, Cozzens found that the neuropharmacology article was more likely to be cited for specific details about its methods and results, while the sociology paper was more often cited for general conceptual points.[95] Similarly, Bazerman found that physics articles

tend to focus on extending specific features of previous work, while political science papers tend to portray past work in broad terms, treat individual papers as a mere representation of an entire approach, and are more likely to claim that "all previous work misses the boat."[1,43]

There is evidence to suggest that the effects of disciplinary consensus may determine a scholar's ability to successfully publish in scholarly journals. Numerous studies have reported that faculty in the natural sciences have a greater number of publications than do their counterparts in the humanities and fine arts.[68,86] This may be because scholars in low-consensus disciplines have encountered significantly higher rejection rates when submitting manuscripts to peer reviewed journals. Average rejection rates reported to be around 30% and 70% for high- and low-consensus disciplines, respectively, with intermediate rejection rates have reported for "hybrid" fields such as anthropology.[44] While it has been argued that journal space shortages account for variance in rejection rates, more recently developed models have demonstrated that variation due to consensus cannot be discounted.[45] Hargens found the rejection rates reported by Zuckerman and Merton have been relatively stable since the late 1960s, suggesting that rejection rates cannot be accounted for by journal space shortages, exclusively.[45] To further support the argument that disciplinary consensus is correlated with rejection rates, Hargens later found that other factors, such as the number of reviewers and average level of agreement among reviewers has minimal effect on rejection rates. Additionally, he found that despite high interdisciplinary variation in journal rejection rates, there is relatively little intradisciplinary variation.[19,45]

The effects of consensus have also been demonstrated in the publication decision process. Journals in low-consensus disciplines tend to reject larger proportion of submissions without peer review, use larger numbers of reviewers, and require more revisions before final acceptance,[45,96] resulting in longer time lags between initial submission and eventual publication.[90] Garvey and colleagues identified these longer time lags by isolating specific points in the pre-publication schedule where the social scientist is likely to spend more time than the physical scientist.[90] For example, they found that there is a greater time lag experienced by social scientists from each of the following points to actual publication; time the research project was initiated, time the research project was complete, time the first manuscripts were started, time the manuscripts were submitted to journals, and time the article was accepted for publication.[90] Additionally, the use of particularistic criteria (e.g. social connections, institution, gender, and race rather than meritorious criteria) in editorial board selections and publication decisions was significantly higher in fields with less highly developed paradigms.[46] The structure of journal systems, themselves are shown to vary across disciplines. High consensus disciplines are likely to maintain a "concentrated" journal system whereby a few "flagship" journals publish the majority of articles in that discipline. By contrast, more diffuse journal systems are maintained by the low-consensus disciplines whereby articles tend to be published in a "spread" of journals across the discipline.[1,93]

Further examination of publication patterns indicates that collaborative research and multi-authored publications are more prevalent in disciplines with higher developed scientific paradigms.[97,98] Strong arguments have correlated this pattern with higher

predictability in high-consensus research, making it more feasible to use division of labor in research work.[15,98] Similarly, faculty in high-consensus disciplines have reported more sources of influence on their current research.[17] Even social support from colleagues has been found to increase publication productivity in high-consensus fields, but not in low-consensus fields.[99,100] This may largely be attributed to the fact that the high level of certainty associated with harder disciplines enhances the feasibility of direct informational support by colleagues. Certainty within a discipline insinuates that there exist specific research guidelines regarding procedures and criteria, making informational support through colleagues an effective means of increasing research publication. Because the soft sciences lack structured research guidelines, colleagues' informational support (by providing information that is shared by most), cannot effectively enhance productivity of the scholar.[100]

In lieu of social support provided by colleagues, it appears that level of "stress" perceived by scholars plays a greater role in affecting productivity of scholars in low-consensus disciplines. Neumann and Neumann found that the perception that one has insufficient time to perform research did not affect productivity in high-consensus fields, but had a negative effect in low-consensus disciplines.[100] Finally, extent of productivity may be attributed to the nature of research performed by scholars in high- and low-consensus disciplines. Arguing that research performed in the "hard" disciplines is more routine than that in the softer disciplines, Hargens examined the association between time spent on research and publication productivity in the disciplines of chemistry (high-consensus discipline) and political science (low-consensus discipline). As expected, he

found a larger correlation between these two variables in chemistry than in political science.[101]

E. The effects of disciplinary consensus on faculty development

Recent studies of disciplinary consensus demonstrate that its effects are pervasive enough to impact research funding, faculty salary, scholarly rewards, department structure, the role of department chairs, job satisfaction, and conformity to scientific norms. When allocating funds for research and scholarship, universities must juggle between fostering the development of excellence in a few selected areas or equal development in all fields of knowledge represented within their institution. Lodahl and Gordon found that departments in high-consensus disciplines obtain substantially higher funding than their low consensus counterparts. Even after controlling for the additional overhead collected from attainment of such funds and overall departmental quality, it was found that the distribution of university funds for research and scholarship were disproportionately allocated to high-consensus disciplines, presumably due to their ability to maintain focused research agendas.[50] Additionally, Fairweather has reported that faculty in high-consensus disciplines are more likely to head funded research projects than those in low-consensus disciplines.[68] Interestingly, scholars in low-consensus disciplines report that attaining funds plays a less significant role in determining their tenure status, which may indicate that university departments have begun to respond to the effects of disciplinary differences.[86]

The overwhelming evidence and implications of disciplinary consensus suggests that scholars in low- and high-consensus disciplines will encounter differences in the way they are evaluated and rewarded. Traditionally, high-consensus fields have enjoyed

higher academic salaries than those in low-consensus disciplines, with similar trends documented as recently as 1997.[68,102-103] It has been demonstrated however, that there exists a stronger correlation between level of productivity and salary within high-consensus disciplines compared to low-consensus disciplines, a phenomenon attributed to high-consensus disciplines' higher agreement on performance standards.[104] It is recognized, however, that these issues need to be addressed for reasons transcending equity and improvement of departmental effectiveness.[102] In addition to enjoying higher salaries, scholars in high-consensus disciplines are reported to spend a greater proportion of their time consulting than are scholars in low-consensus disciplines.[105]

Elements of a discipline's reward system including citations to published work, prestige of current academic affiliation, and scholarly visibility have also been unequally distributed among disciplines.[1,3,106-107] It has been demonstrated that awards distributed in low-consensus disciplines are more likely to be based on personal and social characteristics than are awards in higher-consensus disciplines.[107] Similarly, numerous studies have demonstrated that the likelihood of using particularistic criteria such as department prestige and professional age when electing what works to cite is tends to be higher in low-consensus disciplines.[108-110] With regard to prestige of academic affiliation, Hargens found that academic inbreeding and regionalistic hiring practices are more common in low-consensus fields.[111] High-and low-consensus disciplines vary little, however, in their ability to identify scholars who have contributed the most to their disciplines.[112]

The implications of disciplinary consensus are shown to impact numerous facets of an academic department's structure. Compared with departments in low-consensus

disciplines, those in high consensus fields tend to have a larger faculty, less faculty turnover, more research assistants, higher staff salaries, but fewer credit hours per faculty member.[1,40,50,100] With regard to faculty influence and involvement, Lodahl and Gordon reported that faculty in low-consensus fields have greater influence on decisions affecting their personal work loads and administrative matters, while high-consensus faculty have more influence on curricular planning.[15] In part, the latter finding may be due to Lodahl and Gordon's finding that faculty in high-consensus fields agree more on departmental curricular issues such as the content of undergraduate courses, the content of graduate courses, and requirements for graduate degrees,[1] thus, collectively strengthening their influence on curricular matters.

In studying the goals that chairpersons set for their department, Smart and Elton have found the chairs in high-consensus disciplines emphasize substantive academic goals related to teaching and research such as research productivity, graduate education, and the professional and educational development of faculty and students. In contrast, chairs in low-consensus disciplines emphasize goals related to departmental climate and administrative processes like creating a congenial academic atmosphere.[113] As a result, chairs in high-consensus departments feel they have significant influence over faculty teaching loads, procurement of funding, and faculty promotion decisions, while chairs in low-consensus disciplines feel they exert influence on institution-level policy and faculty recruitment.[114]

Given these findings, it is not surprising to find that high-consensus chairs feel they need training in assessing relationships and personnel communication, while low consensus chairs feel they are in greater need of training that focuses on soliciting

funding and curricular development.[115] In studying the correlates that foster commitment in faculty members, Neumann and Neumann found it is the perception that academic awards are equitably distributed that fosters commitment in high-consensus scholars and the belief that one's work is significant and having a supportive chairperson that does the same for low-consensus scholars.[100]

Berelson found that high-consensus disciplines rate the overall "health" of their discipline more positively than scholars in low consensus fields, and are more satisfied with their graduate-student training.[47] The elements that foster faculty commitment has also reported to be influenced by disciplinary consensus. Scholars in high-consensus fields are more likely to be committed if they feel that rewards are equitably distributed in their institution, while scholars in low-consensus fields are more likely to be committed if they themselves believe that their work is significant and have a supportive department chair.[100] Hargens and Kelly-Wilson subsequently found that anomie exerted strong effects of scholarly pessimism with fields and that disciplinary discontent, or feelings that one's field is stagnant, is attributable largely to dissensus among scholars in that field, rather than on individual characteristics of the scholar.[48]

While high- and low-consensus disciplines have both demonstrated their own types of scholarly deviation (data falsification in high-consensus fields and plagiarism in low-consensus fields),[116] high-consensus scholars are thought to demonstrate greater conformity to the norms of universalism, organized skepticism and disinterestedness[49] As a result, it is argued that low-consensus disciplines require a greater degree of policing of scientific norms.[1] In a related finding, it has been reported that the content of informal discourse among colleagues varies among disciplines; scholars in high-consensus

disciplines will likely discuss research-related issues or "shop talk," while more often, their low-consensus colleagues will tend to "gossip" and dissect their colleagues' personalities, presumably due to the difficulty in discussing research of which there is little consensus.[94] In another related finding, scholars in high-consensus disciplines are found to exhibit a more conservative political orientation than low-consensus scholars.[73,83]

F. A historical perspective of pharmacy's academic subdisciplines

Before determining the presence of disciplinary consensus among pharmacy's academic subdisciplines, it is crucial to understand their historical beginnings. Reviewing the development of these newer and applied subdisciplines reveals that medicinal chemistry, pharmaceutics, pharmacology, pharmacy practice, and SAdS all borrowed from existing basic and social sciences. For example, the systematic application of the physical and biological sciences to pharmacy gave rise to the subdisciplines of pharmaceutics, medicinal chemistry and pharmacology in the early- to mid-1900s.[24] Pharmacy applications of the social sciences came to the scene more recently, whereby the SAdS borrowed from disciplines like psychology, anthropology, economics, and marketing, disciplines already demonstrated to be "softer" or less structured in nature than the basic sciences.[18,24] Because the current subdisciplines borrow from older, more established disciplines, they may struggle in establishing their scientific paradigm, and thus lend themselves well to examination of disciplinary consensus.[18]

Relative to disciplines like philosophy that have been described as far back as fourth century B.C.,[1,60] the discipline of pharmacy is quite young. Driven by the changes

in the pharmacy profession over the last three centuries,[21] pharmacy as a discipline only started to be described in the mid-1800s. At that time, pharmacy education was largely driven by empiricism,[21] and the amount and level of scientific content in the pharmacy curriculum was minimal. Before the Civil War, basic chemistry was the only scientific subject taught in American pharmacy schools, and was thought to form the scientific core of American pharmaceutical education.[118] It was not until the 1860s when pharmacy schools became affiliated with state universities, that science played a much more important role in pharmacy education. However, papers resulting from research at these schools were not related to pharmacy, and graduate programs were not introduced until the turn of the century. At that time, chemistry and pharmacognosy were the dominant disciplines in pharmacy education.[117]

Given the strong presence of pharmacognosy and basic, organic, and analytical chemistry in the late 1800s, it is not surprising to find that medicinal chemistry was the first of the pharmaceutical sciences to gain a firm footing in the early 1900s.[118] Similar attempts to convert empirical and descriptive teaching disciplines into theoretically organized scientific paradigms continued throughout the mid-1900s, primarily in an effort to "academically legitimize" its faculty and curricula.[21] As a result, pharmacognosy appeared later as biochemically based "natural products chemistry," zoology converted to physiology, Galenical pharmacy and physical chemistry into pharmaceutics, and drugstore management to the administrative sciences. These transitioning years in pharmacy education welcomed waves of chemists, pharmacologists, physical pharmacists, and biopharmaceutists to its ranks.[21]

Following the introduction of medicinal chemistry as a discipline, pharmacology was the next to be introduced into the pharmacy curriculum in the early 1900s. Added for the purpose of organizing instruction in other pharmacy courses, the initial reaction to adding pharmacology to pharmacy curricula was mixed. Some schools believed that teaching pharmacology would lead to "counter-prescribing" by pharmacists and conflict with the practice of medicine. By the mid-1900s, the few schools that were accepting of this new discipline hired pharmacologists. Other schools simply re-labeled their traditional pharmacognosy classes as pharmacology courses. A few years later, pharmacology pervaded pharmacy curricula when all schools reported they included pharmacology in their curriculum.[21]

Until the 1950s, pharmacognosy (presented essentially as the physical description of medicinal plant parts)[119] endured as one of the essential elements of the pharmacy curriculum.[120] Shortly thereafter, however, pharmacognosy fell victim to a rapid series of events in pharmacy education including the addition of "educational" courses, physical pharmacy, biopharmaceutics, pharmacokinetics, clinical pharmacy, and externships. Sacrificing pharmacognosy was not difficult to justify, as many pharmacognosy department consisted of one member, who usually found it difficult to meet the needs of the students, profession, and science.[120] In many instances, pharmacognosy as it was known was revolutionized to mimic the science of pharmaceutical analysis.[119]

Although research was carried out on issues that would be considered a part of pharmaceutics (e.g. problems related to drug delivery systems) in the 1800s, pharmaceutics did not actually become established as a discipline in the United States until the 1950s. Broadly conceived as the science of drug delivery, pharmaceutics was

founded on physicochemical principles and derived primarily from the marriage of Galenical pharmacy and physical chemistry. This new hybrid discipline gave rise to the development of novel drug delivery systems and set the stage for studying the fundamental disciplines of pharmacokinetics and biopharmaceutics.[118,119] These latter disciplines shifted students' focus toward the drug product as a therapeutic modality rather than a physical object, and are considered to be largely responsible for the subsequent development of clinical pharmacy.[121]

Pharmacy administration emerged in the 1930s as a means of teaching students elementary accounting techniques and management principles to help new graduates operate a business.[121-124] It was not until the 1960s and early 1970s that pharmacy administration began examining the independent problems of pharmacy and society occasioned by the changing role of the pharmacist and the demands of the public for quality health care.[125-128] As a result, the discipline explored the economic, sociologic and marketing forces on pharmacy practice, and most recently, the legal, ethical and communicative aspects of pharmacy.[121,125,129] While joining the pharmacy curricula later than its fellow pharmacy disciplines, the introduction of pharmacy administration as a discipline did not emerge without controversy. In the late 1970s and early 1980s some questioned whether pharmacy administration scholars had the desire or ability to adequately address the socio-economic problems of pharmacy through scholarship. Criticism was directed toward deans of pharmacy schools for failing to hire pure social scientists (economists, sociologists), and toward graduate programs for utilizing a parochial approach to training scholars in pharmacy administration. In short, the discipline was accused of missing out on opportunities for scholarship and involvement

in major national policy issues that directly impact pharmacy practice.[125] As recently as the 1980s, the discipline was criticized for conducting research that lacked rigor and focus, lacking truly outstanding scientists and acquiring little funding.[126] Despite a slow start for the discipline, pharmacy administration research has made significant contributions to pharmacy's body of knowledge related to the economic and behavioral factors that influence healthcare and pharmacy practice.[124] In part, however, it appears that pharmacy administration continues to suffer the stigma of representing a collection of faculty and coursework still in search of an academic discipline.[124]

No other pharmacy discipline has evolved more dramatically in recent years than pharmacy practice. Unable to establish its role in pharmacy education's attempt to create organized scientific paradigms, pharmacy practice largely fell out of place in the mid-1900s.[21] It was not until the 1970s, after the pharmacy education took "time for introspection," that pharmacy practice was given reconsideration.[21] It was feared that pharmacy education lost sight of its purpose in producing "a generation of pharmacists who knew the chemical structures of phenobarbital and procaine, including several pathways to their synthesis," and who were "experts on the Du Nouy tensiometer."[130] Seeing little need for a pharmacist with limited judgment and minimal problem-solving skills, the social worth of the pharmacist was beginning to be questioned.[21] Blaming the compartmentalization of curricula for producing an "overeducated and underutilized" pharmacist, the 1970s hosted a new era of patient care for pharmacy education and practice. The notion of the pharmacist as a drug advisor was re-emphasized, and the clinical pharmacy movement attempted to recognize the pharmacist as therapeutic advisor.[21] In the last two decades, the emergence of *pharmaceutical care* as a conceptual

practice modality recognizes that the pharmacist's primary responsibility is to the patient and his or her needs related to drug therapy.[130,131] In response to this practice-based movement towards patient care, pharmacy education has come full circle to decompartmentalize disciplines, and adopt an integrated approach to pharmacy education that focuses on disease state therapy.[27-38]

G. Etiologies of Speech Disfluency

Speech disfluency commonly occurs in spontaneous discourse and planned monologue and may be uttered in a number of ways; a hesitation in upcoming speech, a false start or restart of a word or sentence, a word fragmentation, a word repair, a word repetition, a silent or filled pause, or an editing expression (Table I).[132] Although speech disfluencies do not typically compromise listeners' comprehension of speech, they have provided a wealth of information about the architecture of the speech production system. Disfluencies may provide insight into the speaker's confidence, ability to plan forthcoming speech or ability to coordinate conversational interaction.[133-136] Scholars in the fields of psychology and linguistics have made great strides in understanding the organic and environmental causes of speech disfluency, its mitigating factors, the context of its use, and its effect on listeners.

Recent studies of corpora (collections of recorded utterances used as a basis for the descriptive analysis of a language) have demonstrated that speech disfluency may be correlated with the amount of processing load required to produce forthcoming words or sentences. Ovaitt characterized the spontaneous broken disfluencies typical of human-computer interaction. In three empirical studies, subjects spoke or wrote to a highly interactive simulated system as they completed service transactions. Two separate

factors associated with increased planning demands (length of utterance and lack of structure in presentation format), were statistically related to higher disfluency rates. Regression techniques demonstrated that a linear model based on utterance length alone accounted for over 77% of the variability in spoken disfluencies. Additionally, use of a structured presentation format eliminated 60-70% of all disfluent speech uttered during unstructured presentation formats.[137] Shriberg's study of three different corpora of informal phone conversations demonstrated that longer sentences are more likely to contain disfluencies.[138] The association of disfluencies with planning load is consistent with findings that disfluencies more often occur near the beginnings of speaking turns in conversations or beginnings of sentences, where planning effort is presumed to be higher.[138,139] In a similar finding, Maclay and Osgood reported that filled pauses, unfilled pauses and repeats occur more frequently before *lexical* words (e.g., nouns, verbs, adjectives, and prepositions), where the speaker is thought to encounter greater uncertainty than in other parts of speech. Accordingly, they found disfluencies occur less often before *function* words (e.g., connectives, prepositions). Additionally, the investigators found that filled pauses more commonly occur at the juncture of phrases (rather than within phrases), presumably where constructional and content-related decisions are being made.[140]

The topic or domain of conversation is another characteristic that may cause the planning load of utterances to vary. Of particular interest is the occurrence of silent pauses and filled pauses such as "uh", "um", "er", and "ah." It is suggested that these interruptions in the flow of speech are indicative of time needed to search for the next word, phrase, or idea.[56,58] As a result, it is argued that filled pauses are indicative of the

strength (or lack of strength) of association between sequential words or phrases.[57] Indeed, there is evidence to suggest that the content of speech should have an impact on speech disfluency. In other words, the number of filled pauses uttered will depend on the nature of the subject matter. Reynolds and Paivo demonstrated this phenomenon when they asked 48 college students asked to define both concrete and abstract nouns in front of an audience and alone. After controlling for emotional arousal caused by audience conditions, they found that filled pauses were more frequent when subjects defined abstract rather than concrete nouns.[141] Siegman and Pope reported similar findings when they administered Thematic Apperception Test (TAT) cards (picture cards used to stimulate stories or descriptions) of varying degrees of ambiguity to 30 nursing students.[142] Ambiguity, defined as variability of themes evoked by a given card, was found to be positively correlated with speech disfluency. The authors attributed their findings to the mediating role of uncertainty on speech.

The preceding evidence suggests that speech disfluency is likely to occur when abstract or ambiguous phenomena are being described, likely as a result of the speaker having a number of ways in which to describe the phenomenon.[56,58] It follows that the more options a speaker has to describe something at a particular point when speaking, the more likely he or she will utter an “uh”, “um”, “er”, or “ah.” Schachter and colleagues sought to study this phenomenon in lectures of academic disciplines that differ in the extent to which their subject matter and mode of thought require a lecturer to choose among options. In other words, the more formal, structured, and factual the discipline, the fewer the options the instructor has available to describe subject matter.[59] The authors

hypothesized that lecturers in the humanities should use more filled pauses during lectures than social scientists and that natural scientists should use fewest of all.

Following an observation study of 47 undergraduate lectures in the natural sciences, social sciences, and humanities, the investigators found a significant difference in the use of filled pauses among the three types of scientists, confirming their hypothesis. That these differences were due to subject matter rather than self-selection of particular personalities into particular disciplines was suggested by observations of the same set of lecturers all speaking on a common subject. In this circumstance, lecturers in each of the disciplines used the same number of filled pauses. Unable to attribute such differences to demographic variables or scholars' self-selection into disciplines, the phenomenon was attributed to differences in disciplines' "structure of knowledge."[59] Schachter and colleagues suggested that speakers use more fillers when they must choose among a larger range of expressive options.[59,143]

Wanner subsequently argued that Schachter's findings may have been a result of the natural sciences requiring more introductory course time than the social sciences to review standard textbook definitions which, by nature, may be accompanied by little speech disfluency. To test his hypothesis, Wanner replicated Schachter's study in advanced graduate courses in natural and social sciences that would inherently be absent of introductory definition reviews. Wanner's findings were similar to Schachter's, thus lending further support to the argument that speech disfluencies are related to a discipline's "structure of knowledge."[144]

Other researchers have tested similar "cognitive decision point" hypotheses. Goldman-Eisler found that the first word subsequent to an unfilled pause was less

predictable and took significantly longer to enunciate than similar words in fluent contexts.[145,146] Additionally, the word preceding the unfilled pauses tended to be even more predictable than in other fluent contexts. The author reasoned that pauses occurred at junctures representing transitions from relatively high to low redundancy, the speaker having paused at that point in order to make a particular encoding decision about the forthcoming word or phrase. Another study supporting this interpretation found that the frequency of filled pauses was found to vary with the level of cognitive activity required of encoders. Such pauses were more frequent in "interpretations" rather than "descriptions" of subtle cartoons, and diminished with increasing repetition of the same encoding task.[147,148]

Christenfeld manipulated the complexity of options facing a speaker by having 19 undergraduates describe mazes with alternate routes.[149] As expected, the mazes with more options produced more filled pauses. However, in describing even the simplest maze, subjects still used filled pauses, suggesting that options may be only one factor in filled pause production, and that breaking up the rhythm of speech may also foster filled pauses. Further evidence has demonstrated that divided attention may alter the production of filled pauses. Oomen and Postma examined the effect of divided attention (simultaneously performing a tactile-form recognitions task) on the use of disfluency when performing a picture story-telling task.[150] The number of filled pauses and repetitions increased in a situation of divided attention. It is hypothesized that these automatic reactions are due to the increased planning difficulties induced by the concurrent task.[150]

Disfluencies may also occur in attempts by the speaker to coordinate interaction with others.[138] If disfluencies serve a communicative function, they may provide information that enables two people in conversation to better coordinate interaction, manage turn-taking, or align their mental states.[151,152] For example, it has been suggested that speakers use fillers when they cannot develop a phrase in a timely fashion, so as to avoid quickly producing an utterance that is misunderstood or losing their turn to speak.[151-153] Indeed, speakers have been found to use more fillers before answering questions they lack confidence in, then those they have a strong feeling of knowing.[134,151] Additionally, fillers may inform the listener that the speaker has just misspoken, aid in turn-taking in conversation, or serve as a signal that the speaker is in trouble and is requesting help.[135,140,151,154-155]

The idea that fillers may serve, at least in part, as a resource for interpersonal coordination is not incompatible with Schachter and colleagues' finding of higher filler rates in domains with more indeterminacy.[59] That is, when choosing words is more difficult, a speaker's need to account to his or her audience for any delays is presumably greater. This idea is also consistent with Kasl and Mahl's finding of a 41% increase in fillers (but not other kinds of speech disfluencies) in audio-only conversations between people in different rooms, compared to conversations in the same room with visual contact.[156] Similarly, Oviatt found that people talking on the telephone produced more disfluencies than those talking face to face.[137] This may indicate that when eye contact and other visual cues are available, there may be redundant ways of signaling such things as the intention to continue speaking, difficulty with an utterance in progress, or other metacognitive information, leading to lower rates of fillers. The finding that filler rates

are lower in speech produced while gesturing than in speech produced while not gesturing supports this argument.[157]

Beyond processing load and coordination functions, there remain several demographic, psychosocial, and logistic determinants that have been suggested to alter speech disfluency. Age-related changes in cognitive, motor, and perceptual functioning may affect speech in several relevant ways, as older speakers have more difficulty retrieving words than younger speakers.[158] Whether age-related factors increase disfluency rates remains largely unanswered. Some studies have found higher disfluency rates (repetitions, restarts, and fillers) among older speakers.[159,160] However, when Shewan and Henderson studied the occurrence of word repetitions in speaking, they found no reliable age differences in disfluency rates.[161] It has been argued that gender may account for differences in speech disfluency. In Shriberg's study, men produced more fillers than women did, but both genders were equal with respect to other types of disfluency rates. Shriberg cautiously suggested that using more fillers may be a way for men to try to hold on to the conversational floor, but pointed out that in her corpora, gender was confounded with occupation and education level.[138]

Maclay and Osgood have hypothesized that filled pauses should be emitted by the speaker in order to avoid interruption in speaking.[140] For example, if a speaker pauses too long to cogitate their next word or phrase, they risk being interrupted by another speaker, and losing control of the conversation. As a result, the speaker may enunciate a signal (filled pause) that says, "I'm still in control- don't interrupt me!" Accordingly, filled pauses would be expected to occur just before points of highest uncertainty, where choices are most difficult and complicated.[140] Lallgee and Cook have tested the

hypothesis that filled pauses are a product of attempts made to maintain control of the conversational "floor."[162] This hypothesis was tested by altering the pressure on fourteen subjects to continue speaking while controlling for possible confounding effects of anxiety. Results demonstrated that the incidence of filled pauses did not increase as pressure to continue speaking increased, suggesting that the "control" hypothesis may apply more directly to monologues than dialogues. By manipulating 24 interviews under naturalistic conditions, Ball demonstrated that the use of a filled pause at the end of a sentence during an interview will allow the speaker to hold on to the floor for several seconds, suggesting that a terminal filled pause convinces the listener that the speaker has not yet ceded the floor.[163] Beatty sought to test Maclay and Osgood's hypothesis by observing two hour-long supervisions involving a graduate student as a supervisor, and an undergraduate. The remaining sample involved two participants of a seminar engaged in a prolonged interaction. Beatty found that the occurrence of filled pauses significantly reduced the probability of a speaker being interrupted, suggesting that filled pauses may be effective short-term devices for reducing interruption.[164]

Although given less attention than other explanations for speech disfluency, it has been suggested that the occurrence of filled pauses depend on the part of speech they precede.[153] Whether filled pauses occur equally or more frequently before some parts of speech than others is still left to debate.[165] Regardless of the argued explanation for filled pauses, be it to initiate a delay in speaking, search for a word, deciding what to say next, or to keep the "floor," it is argued that speakers plan for, formulate, and produce filled pauses just as they would any other conventional English word.[166]

Another line of thought attempts to introduce more psychodynamic explanations to the phenomenon of speech disfluency. Specifically, numerous studies have been devoted to understanding the effect of anxiety on speech disfluency. While there is strong evidence that many speech disfluencies increase with anxiety,[167-177] there is little to no evidence that *filled pauses* are affected by anxiety.[167,169,170,174,175,177] Mahl, who in his own research has repeatedly failed to find any relationship of anxiety to filled pauses, reviewed seven independent studies, none of which found evidence to suggest that anxiety affects the frequency of filled pauses.[178] Cook, in an attempt to determine the relationship between anxiety and speech disturbances, found that while some speech disturbances are a product of anxiety, filled pauses are not.[179] Recent studies by Cook have found that other types of speech disfluencies are a function of transient anxiety.[167] There have been some studies in which a possible link of anxiety to filled pauses in clinical interview situations was suggested, but their implications are limited by small sample size.[168,180] In a controlled study assessing 24 social phobics with public speaking anxiety, it was demonstrated that these phobics, who reported a greater level of subjective anxiety than nonphobic controls, demonstrated the use of more filled pauses, had longer silent pauses, paused more frequently, and spent more time pausing than controls when giving a speech.[181]

In related study, Fleshler hypothesized that a speaker's anxiety produced by an inattentive audience would manifest itself through increased use of speech disfluency.[182] She conducted a three-phase study whereby four groups of subjects spoke for nine minutes in front of varying combinations of attentive and inattentive audiences. Interestingly, her controlled experiment did not support her proposed hypothesis.

Subjects who spoke in front of attentive audiences in the second three-minute phase were found to utter significantly more filled pauses than subjects who spoke in front of an inattentive audience in the second phase of study. All subjects spoke for in front of an attentive audience in the first three-minute phase of study. Fleshler attributed her findings to speakers in the attentive second phase, seeing that their audiences were responding favorably, sought ways to produce more of the same behavior. Seeking to produce similar behavior resulted in adaptation, or the restructuralization of speech in order to clarify ideas.[182]

According to Schlenker and Leary's social anxiety theory, speakers are more likely to experience anxiety if they are concerned about the impression they are making on the listener, are insecure about the subject they are talking about, or feel that it is unlikely that they are going to make a desirable impression.[183] Similarly, Christenfeld has suggested that anxiety may increase filled pauses not when it makes the speech task more difficult, but when it causes the speaker to pay attention to the speech.[184] Two experiments designed to manipulate evaluation apprehension and self-consciousness both showed dramatic increases in the frequency of filled pauses. Supporting the Christenfeld's initial hypothesis and findings, a subsequent experiment revealed that alcohol consumption, thought to make speech harder but also make one less concerned about what they say, was found to reduce the frequency of filled pauses.

Yet a fourth study by Christenfeld found that Broca's aphasics, who produce simple speech but must deliberate over every word, produce many "ums." Wernicke's aphasics may not talk well, but do not mind, and manage with few "ums." To support the findings of his previous studies, Christenfeld subsequently studied the effects of a

metronome on the frequency of filled pauses, a manipulation previously reported to decrease stuttering.[185] Study results indicated that a metronome had a dramatic effect on the production of filled pauses. Christenfeld subsequently attributed this effect not to any simplification or slowing of the speech, but that a metronome causes speakers to attend more to *how* they are talking and less to *what* they are saying. In another study, Kasl and Mahl's manipulated social anxiety by telling subjects that they were being observed through a one-way mirror, which would be expected to increase evaluation apprehension.[156] Although this manipulation had no effect on filled pauses, it did markedly increase the utterance of other speech disfluencies.

A recent study was conducted based on the premise that several of the above cognitive, social, and situational factors may interact to affect speech production.[186] Knowing that disfluency rates vary across corpora, Bortfield and colleagues improved upon previous studies by evaluating these factors in one speech corpora. While many studies have analyzed various types of speech disfluencies collectively, evidence that different types of disfluencies (particularly filled pauses) may arise from different processes motivated the authors to examine disfluencies such as repeats, restarts, filled pauses, and editing expressions independently. Using a corpus of task-oriented, two-person conversations, the authors systematically varied for speaker age, relationship to conversation partner (familiar vs. unfamiliar), and topic of conversation (children vs. abstract objects) over speaker role (director vs. matcher) and gender.

As expected, disfluency rates were found to increase when encountered with heavier planning demands related to topic familiarity, task role, and length of speaking turn. When speakers discussed abstract figures, they produced greater rates of

disfluencies than when they discussed children. This effect was due mainly to repeats and restarts. Filled pauses, however, were found to be significantly more frequent when subjects described children versus abstract figures, suggesting that filled pauses may arise from different processes such as interpersonal communication in conversational speech. It is important to note that the elevated filler rate for pictures of children was due entirely to male directors. This suggests that male speakers may perceive an imbalance between themselves and their female partners in expertise about children's pictures, and thus be more likely to display their trouble and appeal to their partners for help. Additionally, these findings corroborate those of Shriberg who found that men used more fillers than women in her analysis of speech corpora.[138]

Subjects in the director (initiating speaker) role who emitted longer utterances were found to use significantly more filled pauses, restarts, and slightly more repeats than matchers. Since, however, directors tended to produce longer utterances than their matcher partners, it is possible that higher disfluency rates may be due to the difficulty of planning longer utterances, not their roles as directors. Controlling for turn length, however, demonstrated that directors produced higher rates of fillers than matchers. All speakers used fillers to begin a turn, to end it, alone, between intact phrases, interrupting phrases that would have otherwise been fluent, and in the midst of restarts and repeats; suggesting that most locations of a filler within a conversational utterance may have a variety of explanations. Overall, older speakers produced higher disfluency rates that middle-aged and younger speakers. With increasing age, pairs produced higher rates of fillers within phrases, but similar rates between phrases; this is consistent with the findings that older people have more trouble retrieving words than younger people.[155]

The authors suggested that in conversational speech, fillers may simultaneously have cognitive and interpersonal explanations; it is possible for a filler to be not only a symptom of a word-finding problem, but also a display that solicits help with the problem.[186]

In short, the distributions of disfluencies in this study suggest that some, but not all, disfluencies increase as heavier demands are placed on the speech planning system. Abstract figures are clearly harder than pictures of children for people to describe and match; this assumption was corroborated by the elevated word counts and error rates for abstract pictures over children. Another way in which planning demands are heavier is across task roles; those who took the initiative (directors) produced higher restart and filler rates (but similar repeat rates) compared to those who did not (matchers). For restart rates, the effect of task role is due to the fact that directors must plan longer utterances on average than matchers.

Fillers were distributed somewhat differently that repeats and restarts, suggesting that they may also be related to processes of interpersonal coordination. With a more difficult task, speakers are more likely to have trouble and to display that trouble to an addressee, so the effects of cognitive load will not be independent of effects of interpersonal coordination (if, indeed, the latter are at work). If fillers help speakers coordinate with their addressees, it would be expected that directors, who take most of the initiative in a matching task, would produce more fillers than matchers. This was found to be the case even when turn length was controlled, suggesting that in conversation, directors' elevated rates of fillers are probably not due to cognitive load alone.[186]

In conclusion, there is overwhelming evidence to suggest that speech disfluency may be largely, but not exclusively due to the planning load required to cogitate and format forthcoming speech. Fifteen studies in this review attributed speech disfluency to some form of planning load.[59,137-142,144-150,186] Specifically, seven studies attributed the occurrence of *filled pauses* to planning load.[59,140-142,144,149,150] Two, three and one study attributed *unfilled pauses*,[140,147] *repeats*[140,150,186] and *restarts*[186] to planning load, respectively.

Other studies have attributed speech disfluency to alternative explanations; however, none of these explanations appear to disprove evidence demonstrating that speech disfluency is a product of planning load. It has been found that conducting distracting activities while speaking will increase the utterance of filled pauses and repeats due to the increased planning difficulty experienced by the speaker.[147,150] In cases of conversational speech, it has been reported that filled pauses are emitted by the speaker to avoid being interrupted as they are cogitating forthcoming speech. Again, this argument does not contradict the planning load hypothesis, as filled pauses would be expected to occur just before points of highest uncertainty, where choices are most difficult and complicated.[134,135,140,151-155,162-164]

It has been suggested that demographic characteristics such as age and gender are partly accountable for speech disfluency. This hypothesis however, lacks strength in its empiricism.[138,158-161,186] Most studies have attempted to introduce a more psychodynamic explanation for speech disfluency. While there is strong evidence that many speech disfluencies increase with transient anxiety,[167-177] there is little to no evidence that *filled pauses* are affected by anxiety.[167,169,170,174,175,177] It appears that evaluation apprehension,

or the extent to which speakers are concerned about the impression they are making on the listener, may play a greater role in the utterance of speech disfluency.[153,183-185]

Table I. Disfluency classifications.

Disfluency Class	***Example***
Hesitation	~~sh~~. . .she liked it
False start	~~he~~. . .she liked it
Restart	~~It was very~~. . .she liked it
Word fragmentation	she ~~lik. . .ed~~ it
Word repair	~~shle~~ . . . she liked it
Word repetition	~~she~~. . .she liked it
Silent pause	she. . . . . .liked it
Filled pause	she. . .~~uh~~. . .liked it
Editing expression	she. . .~~I mean~~. . .she liked it

III. METHODS

A. Study design and sampling

A content analysis procedure utilizing a descriptive, cross-sectional design was conducted to measure the frequency of speech disfluency occurring in lectures within five subdisciplines of pharmacy. Lectures in each of the five subdisciplines were observed for occurrences of speech disfluency, while controlling for lecturers' inherent disfluency rate when speaking informally during interviews. Attempts were made to determine if relationships existed among lecturers' age, gender, native language, teaching experience, institution where they teach, type of undergraduate degree, their self-rated level of general anxiety, and their self-rated fear of being evaluated negatively by their students. The subdisciplines included those studied by Desselle and colleagues in their examination of disciplinary consensus; medicinal chemistry (including medicinal chemistry, pharmaceutical chemistry and pharmacognosy), pharmaceutics, pharmacology, pharmacy administration and pharmacy practice.[18,26] The current investigators excluded disciplines such as continuing professional education, libraries/educational resources and biological sciences due to their small representation or absence in many colleges and schools of pharmacy. Lecture observations were conducted during the 2002-2003 school year (September 2002-May 2003) at four ACPE-accredited schools of pharmacy listed below. The following schools were selected to provide a larger sample than would be obtained at the investigator's school of attendance (Duquesne University), and to provide for a sample of universities that vary in setting and type (Table 2).

Table 2. Universities selected for lecture observation.

School of Pharmacy	***University***	***Location***	***Type***
Mylan School of Pharmacy	Duquesne University	Pittsburgh, Pennsylvania	Private, urban
School of Pharmacy	University of Pittsburgh	Pittsburgh, Pennsylvania	Public, urban
Raabe College of Pharmacy	Ohio Northern University	Ada, Ohio	Private, non-urban
School of Pharmacy	West Virginia University	Morgantown, West Virginia	Public, non-urban

Because speech disfluency will be evaluated as a proxy measure for *disciplinary* consensus, the *course*, rather than the *instructor*, served as the sampling unit in this study. In August 2002 and December 2002, course catalogs (including course titles, schedules, instructors, and course descriptions) were obtained from each university's website for the Fall 2002 and Spring 2003 semesters, respectively. The sampling frame of courses for both semesters at each school of pharmacy was determined through the application of the following inclusion and exclusion criteria.

1. Sampled courses must be offered by the designated school of pharmacy, and may not be offered by another college or school in the university.

2. Sampled courses are limited to didactic courses that fulfill professional-phase requirements for the school of pharmacy's Entry-level PharmD program.

3. Pre-professional courses that serve as part of the university's core curriculum as a requirement or pre-requisite for professional-level courses in an entry-level degree program were excluded from analysis.

4. Pharmacy courses developed for the purpose of training non-traditional PharmD students were excluded from analysis.

5. Elective courses were excluded from analysis for several reasons. Previous evaluation of disfluency in the classroom has not examined elective courses. Additionally, elective courses vary in format from formal lectures to informal discussions and may also vary in class size. Elective courses are commonly developed independently by the course instructor, whereby required undergraduate courses necessitate the meeting of standardized competencies. As a result, a lack of consistency in the types of elective courses offered by schools of pharmacy may exist.

6. To obtain adequate speech samples for determining disfluency rates, any course employing an alternative method of instruction from a traditional lecture format was excluded from analysis including:

    a. Courses offered online
    b. Experiential, rotating or on-site practicum
    c. Laboratories employing bench-work instruction
    d. Virtual pharmacy practice laboratories
    e. Case-study based courses
    f. Service-learning courses
    g. Orientation programming or sessions
    h. Seminars
    i. Recitation sessions
    j. Independent study courses

7. Televised courses, or courses broadcast via satellite from remote locations were excluded from analysis due to poor quality of audio recordings and compromised student/instructor interaction compared with that encountered in the traditional classroom.

Courses that remained in the fall and spring semester sampling frames were assigned to one of the five academic subdisciplines of pharmacy listed above. A course's assignment to one of the five disciplines was based on the course instructor's designation to one of the five disciplines according to the 2002-2003 AACP Roster of Professional Faculty and Staff.[187] There remained one instance whereby an instructor was teaching a course that belonged to a discipline outside of his or her discipline (as designated in the AACP roster) as determined through the catalog description of that course. In other words, an instructor was teaching a course outside of the discipline designated to them by AACP. In this case, an appeal was made to the pharmacy school's associate and assistant deans to determine and come to a consensus on the subdiscipline to which they believed the course belonged, independent of the lecturer's AACP designation.

Each school of pharmacy offered multidisciplinary courses (or modules) that integrated all or some of the five subdisciplines under a common theme such as a disease

state. Before conducting sampling procedures, the course masters of these multidisciplinary courses were contacted regarding the specific breakdown of disciplines. After determining the breakdown of these courses, each subdiscipline in the multidisciplinary course was treated as an individual course for the remainder of the study, and was assigned to a subdiscipline using the methods described above if it was not excluded by the sampling criteria.

A stratified random sampling procedure was used to determine the sample for study. One course in each of the five subdisciplines in the four universities during each of the two semesters (40 courses) was randomly sampled. Two lectures in each of the sampled courses were observed. Courses were randomly sampled by means of an online random sampling program (Research Randomizer).[188] The lecturers of courses sampled were contacted to explain the nature of the study, verify the applicability of inclusion and exclusion criteria that could not be determined by the course listings, obtain consent for study participation, and determine the data collection schedule. Contact information for each of the lecturers was obtained through the AACP Roster[187] and university websites.

It is important to note that sampling methods in this study differ considerably from those employed by Schachter and colleagues in their examination of speech disfluency in the natural sciences, social sciences and humanities.[59] Schachter and colleagues conducted all observations at their home institution, and selected four to seven classes from each of three to four departments in each of the divisions of natural sciences, social sciences and humanities. The choice of instructors observed depended entirely on who happened to be teaching undergraduate lecture courses during the three semesters in which lectures were observed.

Upon contacting the lecturer of the sampled course, the principal investigator attempted to determine if any of the exclusionary criteria applied that was not detected by examination of the course catalog, alone. Additionally, the investigator verified that the lectures adhered to a traditional lecture format, rather than a discussion format. If the course met criteria for observation, the investigator attempted to attain verbal consent from the lecturer. For the purpose of obtaining verbal consent, the study was described as an observation of the linguistic components of pharmacy lectures. Specifically, it was described as "an observation of speech patterns and the use of/lack of use of certain utterances and terminology during pharmacy lectures." Potential subjects were told that data would be evaluated collectively with other lectures and by no means would be an assessment of teaching style. Lecturers were informed that data collection would include observation and audio recording of two of their lectures, audio recording of a 15-minute interview, collection of demographic data, completion of a questionnaire, and completion of an anxiety measure. Lecturers were told that they would receive a written consent form at the time of data collection, and if desired, would be able to withdraw their consent at that time. Again, these procedures differ from those employed by Schachter and colleagues whereby observers did not announce their presence in class, but rather, inconspicuously attended lecture for the purpose of tallying speech disfluencies.[59]

If verbal consent for participation was obtained, the principal investigator made efforts to establish an observation schedule. In scheduling observations, it was determined if more than one lecturer would be responsible for disseminating lecture material to students. In such cases, observation schedules were limited to observing only the consenting instructor for both lectures. At this time, the principal investigator

verified that teaching assistants, graduate students or guest lecturers/speakers were not teaching the observed lectures of the sampled course. While scheduling observations, efforts were made to avoid observation during the first and last week of class, while still scheduling the two lecture observations as far apart as possible.

If it were found that the course was not taught using a traditional lecture format, was excluded by sampling criteria, or that consent for participation was not granted, the sampled course was removed from the sampling frames. Another course was randomly sampled from the same stratum using the sampling procedures described above. If repeated sampling from the same stratum (e.g., all medicinal chemistry courses offered at Duquesne during the fall semester) exhausted that stratum, a course in that discipline was randomly sampled from a collective pool of all courses in that discipline offered by the remaining universities whose strata were not exhausted (e.g., a new medicinal chemistry course is randomly sampled from all medicinal chemistry courses remaining in the sampling frame from University of Pittsburgh, Ohio Northern University, and West Virginia University in the fall semester). Indeed, exhausting many strata resulted in an unbalanced sample described in Section IV.

A similar sampling procedure was repeated in the second semester of study. However, if a course offered in the spring was already observed in the fall (indicated by the same course number), the spring offering was removed from the sampling frame. Conversely, spring courses that were taught by lecturers who were already observed in the fall for another course were not excluded from analysis in the spring.

B. Institutional Review Board procedures

The current study was submitted for review to each University's Institutional Review Board (IRB). Duquesne University (primary reviewer) granted approval based on an expedited review in the Fall of 2002. To receive approval for study, a written consent form including investigator contacts, source of support, purpose, risks/benefits, compensation, confidentiality, and right to withdraw was developed for the purpose of obtaining written consent from participants (Appendix A). Pending Duquesne University's approval, the University of Pittsburgh and Ohio Northern University (secondary reviewers) granted approval upon expedited review. West Virginia University (secondary reviewer) exempted the study from review. In order to protect the identity of participants in labeling, storing and analyzing data, the following coding scheme was used to identify lectures observed and interviews conducted (Table 3). For example, the first medicinal chemistry lecture observed at Duquesne in the fall semester of 2002 was coded as *DMCF1*.

Table 3. Subject coding scheme.

University Code	***Discipline Code***
D = Duquesne	MC = Medicinal Chemistry
P = Pittsburgh	PE = Pharmaceutics
O = Ohio Northern	PO = Pharmacology
W = West Virginia	PA = Pharmacy Administration
	PP = Pharmacy Practice
Semester Code	***Data Code***
F = Fall	1 = Lecture 1
S = Spring	2 = Lecture 2
	3 = Interview

C. Data collection

Lecture observation

The principal investigator served as the observer of selected lectures and was present for the duration of all lectures chosen for observation. All lectures were recorded in their entirety, but only the first 50 minutes of each lecture were saved and analyzed after all editing procedures. A Sony ICD-MS515 digital recorder[189] was used for recording. This recorder was used because of its capability of timing recordings, logging the date and time of recordings, filing recordings into folders that may be labeled for future identification, and digitally editing the recordings. Additionally, the use of digital technology prevents the risk of accidentally recording over a previous recording and allows the user to save backup data to a compact disk or hard drive.

Two subjects declined consent for audio recording. During these observations, the investigator manually timed lectures with a stopwatch, and tallied speech disfluencies as they occurred during the lecture. All recorded data was transferred to the Toshiba Satellite Pro PC using Memory Stick Voice Editor ver. 2 application software[189] and Windows XP Professional operating system.[190] The Memory Stick Voice Editor software was used as an extension of the recorder itself, allowing the investigator to back up collected data on hard drive and compact disk, play back recordings, and digitally edit data as necessary for study protocol.

There were seven circumstances whereby disfluencies were not coded, either because they involved discussion of a subject matter unrelated to the specific discipline being lectured, or were otherwise a disruption of the lecture. Recordings were edited to remove the following timed data from lectures.

(1) Announcements made at the introduction or conclusion of the lecture, whereby the content of the announcements are universal to any of the subdisciplines. The announcements are made for the purpose of "bookkeeping" and are not considered part of the lecture content. Examples include announcing exam results, due dates for upcoming assignments, and laboratory issues.

(2) Any announcements made by students, regardless of whether they are members of the observed class, for the purpose of advertising fundraisers, social functions, organization meetings or other events.

(3) Any point in time when a student interrupts or pauses the formal lecture in session to address an issue related or unrelated to the lecture material, or to pose a question that requires the lecturer to pause from the formal lecture and material being presented to address the issue or answer the question.

(4) Situations whereby the lecturer interrupts lecturing to pose a question related or unrelated to the course material. The question is not hypothetical, but rather, necessitates a response from students. Data were edited regardless of whether students responded to the question.

(5) Any event promulgated by either the instructor or student that results in discussion among the student(s) and instructor or several students. The discussion may be related or unrelated to the material being presented at the lecture.

(6) Any instance whereby the lecturer needs to interrupt the lecture in order to reprimand a student or group of students for classroom behavior.

(7) Any instance whereby a lecturer pauses his or her lecturing to allow students to take notes or write down the lecturers previous statements. Includes instances in which the lecturer stops the lecturing to examine their own notes.

Based on a literature review examining the etiologies of speech disfluency, instances of speech disfluency in this study corpus were coded as *repeats*, *restarts*, and *filled pauses* as defined in the following operational definitions.

Filled pauses. Filled pauses were operationally defined as the sounds **m, r, ?, æ,** or **ɐ** (phonetically pronounced as **"um," "er," "uh," "ah,"** and **"eh"**), that were observed among otherwise fluent speech.[59,140] If the created sound was or resembled any sound that forms part of a word, even if it was detached from the word, was garbled, or incomplete, it was not coded as a filled pause. Pronunciation of the indefinite article "a" was not coded as disfluent article if its use was appropriately annunciated in terms of the context in which it was used.[59]

Repeats. Repeats were defined as all repetitions, of any length, that were semantically non-significant. For example, in the utterance, *I I saw a very very big boy*, *I* is defined as a repeat but *very* is not. In the latter case, the repetition intensifies *big* and thus changes the meaning, while the repetition of *I* bears no meaning. In other words, the utterance with or without the repeated *I* is considered the "same" in meaning, while utterances with one versus two occurrences of *very* would be judged "different." A repeat can vary from a single word to a phrase that could be any length. However, each repeat was coded as *one* disfluency, regardless of its length. Cases in which phrases or statements are repeated

intentionally for purposes of clarification during the lecture were not coded as a repeat.[140,186]

Restarts. Restarts were defined as an incomplete or self-interrupted utterance whereby the speaker backs up in an attempt to correct one or more of the words he or she has already used. For example, *I saw a very big // a very small boy* is a self-interrupted utterance with a restart following *big*. Each restarted stretch of speech was coded as one disfluent article, even if the repaired phrase consisted of more than one word.[140,186]

Two distinct disfluent articles that occurred one right after the other (such as a restart after a filled pause) were coded as two disfluent articles. Similarly, if there were two or more disfluent articles of the same type in a row (e.g. several filled pauses uttered consecutively), each disfluent article was coded individually. Data collection forms for the lecture observation phase of the study have been provided in Appendix B (Data collection forms B and C). Documentation of lecture observations included; (1) the discipline designation of the lecture being observed, (2) the date and time of the evaluated lecture, (3) the length of the recorded lecture in minutes and seconds, (4) a tally of the speech disfluencies occurring during the lecture, (5) the number of speech disfluencies observed during the length of the lecture, and (6) the number of speech disfluencies per minute.

Demographic Data

Although *courses* (rather than *instructors*) served as the sampling unit in this study, the investigator made efforts to collect data related to the subjects themselves, as it is possible that characteristics inherent to the lecturers may potentially confound study results. Accordingly, demographic data collected included subjects' school of pharmacy, gender, age, native language, and undergraduate degree. Additional data collected included subjects' years of teaching experience, number of times they taught the observed class, number of times the course of interest has been offered, and number of students taking their course. Desselle and colleagues have reported differences among scholars' perception of their discipline's paradigm development based on type of institution where they teach,[18,26] thus prompting the investigator of the current study to document the school of pharmacy where the observed subjects currently teach. Schachter and others have considered the impact of a lecturer's age and gender on their disfluency rate,[59,138,158-161,186] prompting the current investigator to collect similar demographic data. Additionally, the investigator ɑllected data concerning lecturers' native language (English as "primary" versus "secondary"), undergraduate degree, the number of times they taught the observed course, the number of years the course of interest has been in existence, and the number of students taking the observed course. Subjects were asked to provide the demographic information while meeting with the investigator after lecture observations. A sample data collection form for demographic information can be found in Appendix B (Data collection form A).

Evaluation Apprehension

According to Schlenker and Leary's social anxiety theory, speakers are more likely to experience anxiety if they are concerned about the impression they are making on the listener, are insecure about the subject they are talking about, or feel that it is unlikely that they are going to make a desirable impression.[183] Several studies have supported the argument that evaluation apprehension may account for the occurrence of speech disfluency while speaking. Christenfeld has suggested that anxiety may increase filled pauses not when it makes the speech task more difficult, but when it causes the speaker to pay attention to the speech.[184,185] Kasl and Mahl's manipulation of social anxiety by telling subjects that they were being observed through a one-way mirror, which would be expected to increase evaluation apprehension had no effect on filled pauses, but did markedly increase the rate of other speech disfluencies.[156]

The Fear of Negative Evaluation (FNE) Scale[191] is the most commonly used measure to determine the degree to which people experience apprehension at the prospect of being evaluated negatively. As the nature of the construct predicts, persons with high scores on the FNE scale tend to behave in ways designed to avoid the prospect of being evaluated unfavorably. Given their apprehension about others' evaluations of them, it is not surprising that high FNE scorers tend to be more socially anxious than low FNE scorers.[191,192] Limited in utility by its length, Leary developed the Brief-FNE, a 12-item version of the original scale demonstrating nearly identical psychometric properties to the full-length scale with considerable evidence of its validity and reliability (Appendix E).[193]

In an attempt to capture the evaluation apprehension that may be experienced by lecturers in the classroom, items contained in the Brief-FNE were modified to more

appropriately reflect situations whereby a lecturer may experience evaluation apprehension in the classroom (Appendix C). Content of the items were preserved but modified to reflect similar contexts in the classroom. Reverse-coded items remained as such in the modification of items. Attempts to determine the validity of the modified instrument were made at the Midwestern University Chicago College of Pharmacy. Fourteen pharmacy faculty members were asked to complete the Brief-FNE, modified Brief FNE and the Personal Report of Communication Apprehension (PRCA-24) (Appendix F).[194]

The PRCA-24 is a 24-item instrument employing a 5-point Likert-type scale that assesses individuals' communication apprehension in general and across four contexts: public, small group, meeting, and dyadic encounters.[195] Six items represent each context, and communication apprehension is scored by summing participants' responses across all 24 items. The PRCA-24 is internally consistent; alpha reliability estimates for all 24 items range from 0.93-0.95.[195,196] Published studies support the construct and criterion-related validity of the instrument.[195,197]

The correlation coefficient (r) between the Brief-FNE and modified Brief-FNE was found to be 0.28, suggesting that the instruments measure somewhat distinctive constructs, and that modifying the instrument to measure apprehension in the lecturing scenario adds more situational characteristics than trait characteristics. Overall, the Brief-FNE was found to exhibit a higher correlation with the PRCA-24 than the modified Brief-FNE, suggesting that fear of evaluation (particularly in the classroom) is a distinctly different construct (Table 4). It is worthy of note, however, that the modified Brief-FNE exhibited the highest correlation with the public speaking context, the most

appropriate context to accommodate lecturing in the classroom. While the PRCA-24 was used for the purpose of determining the validity of the modified Brief-FNE, this instrument was not used in the study, itself. This is primarily because of an assumption by the investigator that an individual pursuing teaching as a profession may inherently exhibit little, if any, communication apprehension. Because it exhibited less correlation with the PRCA-24 (with the exception of the public speaking context) the modified version of the Brief-FNE was selected as the measure of fear of negative evaluation in this study in a an attempt to capture a construct distinct from that of communication apprehension. Additionally, its low correlation with the Brief-FNE suggests that the instrument may capture more situational characteristics (in the lecturing scenario) than trait characteristics. Faculty at the Chicago College of Pharmacy were asked to review items in the modified Brief-FNE for face validity and clarity.

Table 4. Correlation coefficients (r) among the PRCA-24, Brief-FNE and Modified Brief-FNE.

PRCA-24	***Brief-FNE (r)***	***Modified Brief-FNE (r)***
Group	0.42	0.15
Meeting	0.33	0.15
Interpersonal	0.66	0.10
Public	-0.15	0.39
Total	0.40	0.22

Anxiety Measures

With the exception of filled pauses, there is strong evidence that many speech disfluencies increase with transient (state) anxiety,[167-177] While evaluating the level of evaluation apprehension was intended to capture a lecturer's level of state anxiety in the classroom, the investigator also sought to determine subjects' level of trait, or general anxiety. While collecting demographic data, subjects were asked to rate, on a 10-point scale, the level of anxiety they feel on a day-to-day basis. The scale ranges from "not at all anxious" ("1") to "extremely anxious" ("10") (Appendix D). The validity of these types of anxiety ranges and the reliability of retrospective measurements have been previously reported.[198] Vrolijk has used this type of anxiety scale in public speaking situations,[199] however, such measures have more commonly been used to assess longitudinally student teachers' level of anxiety prior to and following a given lecture.[200-202]

Subject Interviews

Several recent studies in psychology and education have been concerned with the self-selection phenomenon.[203-208] Specifically, it has been argued that a scholar's decision to pursue a particular discipline may depend upon their personality type, worldview or scientific predilection.[209] In other words, it may be the nature of individuals pursuing a particular discipline, not the discipline, itself, that accounts for disciplinary differences. It is possible that characteristics inherent to the scholar may manifest themselves when measuring speech disfluency. As a result, this study controlled for subjects' inherent disfluency rate, irrespective of the discipline to which they belong.

The investigator employed a control mechanism used by Schachter and colleagues in their examination of speech disfluency in the classroom,[59] and conducted interviews with subjects concerning a common topic that is unrelated to the subdisciplines, themselves. If it is the inherent nature of the scholar attracted to a specific subdiscipline that is responsible for differences in speech disfluency among these fields, there should be little difference, for each individual, between the use of filled pauses during the academic lecture and during the interviews. If, on the other hand, it is the nature of the subdiscipline that is responsible for differences in speech disfluency, there should be differences between the lecture and the interview. Moreover, the use of additional speech content outside of the scholar's lecture serves as a control for differences in individual speech patterns and styles.

At the scheduled date and time of the interview, the investigator proceeded to conduct a brief and directed interview of the subject for approximately 15 minutes. The intent was to discuss a subject universal to academicians in all subdisciplines of pharmacy. Careful attention was made to avoid topics specifically related to the subject's discipline, itself, so as to maintain the integrity of the control mechanism in place. The interview followed a directed and specific outline, so as to keep the interviews as standardized as possible. Contingencies were made as necessary to restrict the subject or probe the subject as necessary to stay within the standardized interview topic. The interview protocol can be found in Appendix G. The investigator proceeded with topics in order listed until a fifteen-minute speech sample was obtained, however no interviews went beyond the first three topics listed. All interviews were digitally recorded with the

exception of two subjects who did not grant consent for audio recording. In these cases, a stopwatch was used to time interviews while the investigator tallied disfluencies.

D. Analysis

Data were analyzed with the use of SPSS-PC version 11.0.[210] Descriptive data of study subjects was reported, including university, gender, age, native language, undergraduate degree, number of years teaching, number of times the subject has taught the course of interest, number of times the course of interest has been offered, and number of students taking the course of interest. The frequency of speech disfluency occurring in the lectures and interview sessions was recorded as the number of disfluencies per minute. The average number of disfluencies per minute was calculated for two lectures of the same course before averaging the rate of speech disfluency in each of the five academic subdisciplines of pharmacy.

As is the nature of studies of content, the reliability of measurements should be established. To that end, the reliability of disfluency counts was estimated. Two entry-level PharmD students who were blind to the study hypothesis were trained to conduct disfluency measures on 10% (six lectures) of observed lectures. Training included review of operational definitions of each type of disfluency and listening to lecture samples simultaneously with students to test their ability to identify disfluencies of interest. When the students demonstrated competency in identifying each type of speech disfluency, they were permitted to conduct their disfluency measures. Intraclass correlation using a two-way mixed effect model was used to determine the consistency (rather than absolute agreement) of measurements. Intraclass correlation is based on analysis of variance to arrive at an estimate of the part of measurement that is attributable to error and compares covariance of the ratings with total variance. The two-way mixed

effect model is appropriate when judges are fixed and are the only judges assigned to the study (i.e., the judges have not been randomly sampled from a population of judges). Unlike the Pearson product-moment correlation coefficient, this measure is directly interpretable as the percentage of variance attributable the true differences between subjects.[211,212] Intraclass correlation has been used by Schachter and colleagues in testing the reliability of disfluency rates.[59]

A series of one-way ANOVAs was conducted to determine if differences exist in the rate of speech disfluency by lecturers among the five subdisciplines of pharmacy, four pharmacy schools, age of the lecturer, years of teaching experience, and number of years teaching the course in this study. An independent samples t-test was conducted to determine if differences exist in the rate of speech disfluency by lecturers' gender and undergraduate degree (pharmacy or other). For each statistical test, Levene's tests for violations of homogeneity of variance (assumption the error variance of disfluency rate is equal across disciplines) were conducted before selecting an appropriate post-hoc test for ANOVA procedures. Alpha (significance level) was set a priori for all statistical tests at 0.05. An analysis of covariance (ANCOVA) was conducted to determine if differences existed in the frequency of speech disfluency among the subdisciplines of pharmacy after controlling for lecturers' inherent disfluency rate. Specifically, ANCOVA controls for individual variation (i.e., lecturers' inherent disfluency rate). The data was tested for violationsin homogeneity of variance and sphericity (assumption that regression slopes across groups are equal) before selecting an appropriate post-hoc test and interpreting results.

The correlation between subjects' modified Brief-FNE scores and disfluency rate in lectures was determined using Pearson's correlation coefficient. Before determining the correlation, however, the data for both variables was examined to verify that it followed a normal distribution, demonstrated a linear relationship, and was absent of outlier cases. A similar procedure was conducted for determining the correlation between general anxiety scores and disfluency rates in lectures.

IV. RESULTS

A. Descriptive data

Using the sampling procedures described in Section III, a total of 24 subjects provided consent for the observation of 31 courses among the four universities studied. Descriptive data for the courses and subjects are provided in Table 5. Nearly one-half of the sampled courses were medicinal chemistry and pharmacy practice courses, while the remaining half included an approximately equal distribution between pharmaceutics, pharmacology and SAdS courses. Nearly one-half of courses were observed at Duquesne University. The institution wherein the fewest number of observations were conducted was the University of Pittsburgh.

Approximately 63% of participants were male, and only one subject reported having a native language other than English. On average, participants were 44.57 ± 8.91 years of age, reported having 13.05 ± 8.34 years of teaching experience, 7.14 ± 7.09 years of experience teaching the course observed in the study, and had 117 ± 27 students enrolled in the course. Three-fourths of subjects have undergraduate degrees in pharmacy. Subjects were unable to specify how long their observed course has been in existence, primarily due to recent curricular modifications in adopting entry-level PharmD programs. Consequently, this variable was precluded from further analysis.

Table 5. Descriptive data of courses, subjects and their employing academic institutions.

Characteristic	*n*	*%*
Discipline[a]		
Medicinal chemistry	8	25.8
Pharmaceutics	5	16.1
Pharmacology	6	19.4
Social and administrative sciences	4	12.9
Pharmacy practice	8	25.8
Institution[a]		
Duquesne University	15	48.4
University of Pittsburgh	3	9.7
Ohio Northern University	8	25.8
West Virginia University	5	16.1
Gender[b]		
Male	15	62.5
Female	9	37.5
Native language[b]		
English	23	95.8
Other	1	4.2
Undergraduate degree[b]		
Pharmacy	18	75.0
Other	6	25.0

[a]Totals are based on the total number of courses sampled (n=31).
[b]Totals are based on the total number of subjects sampled (n= 24).

B. Reliability of disfluency measurements

Prior to conducting further statistical tests, an intraclass correlation coefficient was calculated to determine the reliability of disfluency measurements made by the investigator. The intraclass correlation was calculated using a two-way mixed effect model (rater x lecture) as a measure of consistency between the investigator and two pharmacy-student judges trained in disfluency measurement as described in Section III. The resulting correlation coefficient was 0.91.

C. Frequency of speech disfluency in lectures

The overall mean disfluency rate in lectures was 2.79 disfluencies per minute. This mean rate is comparable to Schachter's finding of a mean rate of 3.36 disfluencies per minute in lectures in the natural sciences, social sciences and humanities. It is important to note, however, that Schachter measured *filled pauses* only, while the current study measured *filled pauses*, *repeats*, and *restarts.* Therefore, the mean rate reported in this study may actually appear quite high relative to the mean rate reported by Schachter. Before testing for differences in disfluency rates, mean disfluency rate for each discipline were plotted to determine if outlier cases existed in the data (Figure 1). Indeed, three outlier values (provided by a single subject) were identified at rates of 8.04, 9.55 and 9.93 disfluencies per minute and were removed from the data before proceeding with statistical tests. The overall mean disfluency rate in lectures was 2.11 disfluencies per minute after removing outliers.

Figure 1. Scatterplot of disfluencies per minute during lectures in (1) medicinal chemistry, (2) pharmaceutics, (3) pharmacology, (4) pharmacy administration, and (5) pharmacy practice.

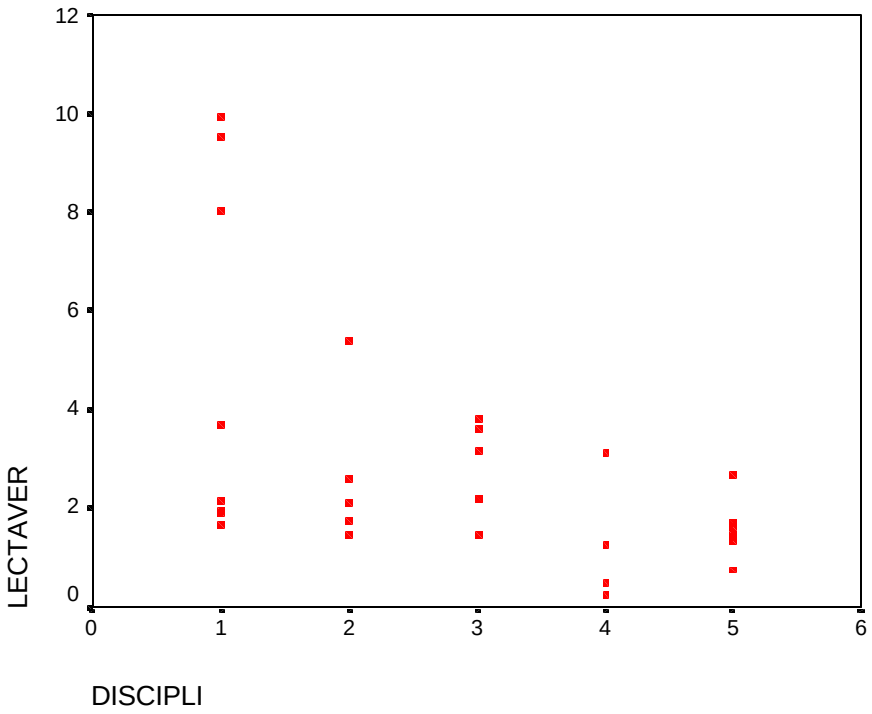


Table 6 provides the results of one-way ANOVA and independent t-test procedures on lecture disfluency rate. Examination of Levene statistics indicated that homogeneity of variance assumptions were not violated while conducting these tests. While not achieving statistical significance, medicinal chemistry, pharmaceutics and pharmacology lectures were found to have higher disfluency rates (2.27 ± 0.81, 2.67 ± 1.59 and 2.74 ± 0.93, respectively) than were SAdS and pharmacy practice lectures (1.28 ± 1.31 and 1.59 ± 0.53, respectively). There were no significant differences identified among institution of employment, gender, age, teaching experience, experience teaching the observed course, or type of undergraduate degree held. Because no significant

differences were identified, it was not necessary to control for these variables in the main analysis (ANCOVA), and risk conducting a multivariate analysis pulling out degrees of freedom (*df*) and creating empty cells.

Table 6. Results of ANOVA and independent samples t-tests to compare discipline, institution, gender, age, teaching experience, years teaching observed course, and undergraduate degree with disfluency rates in lecture.

Variable	***Mean disfluency rate (disfluencies/minute) ± S.D.***	***Significance***
Discipline		
Medicinal chemistry	2.27 ± 0.81	F = 2.14; df = 4, 27; p = 0.108
Pharmaceutics	2.67 ± 1.59	
Pharmacology	2.74 ± 0.93	
SAdS	1.28 ± 1.31	
Pharmacy practice	1.59 ± 0.53	
Institution		
Duquesne University	1.90 ± 1.15	F = 0.42; df = 3,27; p = 0.742
University of Pittsburgh	2.18 ± 0.43	
Ohio Northern University	2.52 ± 1.42	
West Virginia University	2.27 ± 1.06	
Gender		
Male	2.11 ± 0.89	t = -0.005, df = 26, p = 0.996
Female	2.11 ± 1.43	

Table 6 (con't). Results of ANOVA and independent samples t-tests to compare discipline, institution, gender, age, teaching experience, years teaching observed course, and undergraduate degree with disfluency rates in lecture.

Variable	Mean disfluency rate (disfluencies/minute) ± S.D.	Significance
Age		
< 40 years	2.13 ± 1.27	F = 0.813; df = 2, 23; p = 0.457
40-49 years	2.08 ± 0.94	
= 50 years	1.55 ± 0.65	
Teaching experience		
< 10 years	1.75 ± 1.17	F = 0.673; df = 2, 23; p = 0.521
10-20 years	2.26 ± 0.78	
> 20 years	1.90 ± 0.35	
Experience teaching course		
<5 years	1.81 ± 0.75	F = 0.63; df = 2, 23; p = 0.542
5-7 years	2.16 ± 0.94	
= 8 years	1.67 ± 1.13	
Undergraduate degree		
Pharmacy	1.96 ± 1.11	t = 1.96, df = 26, p = 0.173
Other	2.66 ± 1.02	

D. Controlling for inherent disfluency rate

The mean disfluency rate in lectures and interviews are provided in Table 7 and Figure 2. Four interviews were not conducted because consent was not received, the subject could not schedule an interview, or the subject could not be contacted. This reduced the sample size to 24 subjects in the analysis controlling for subjects' inherent disfluency rates. As a result, the mean disfluency rates for lectures are different from those reported in Table 6 that reflects all observed lectures. Before interpreting results of ANCOVA procedures, data were tested for violations of the assumptions of homogeneity of variance and homogeneity of regression slopes across disciplines. Levene's test indicated that error variance in disfluency rate were not equal across disciplines. This may result in a "F" test that is liberal. In other words, this would result in falsely rejecting a null hypothesis more often than would be assumed through the statistical test (e.g. 11% of the time instead of 5% of the time).[213] This may not be of great concern however, as the exploratory nature of this study precluded the development of hypothesis. The regression slopes across disciplines, however, were found to be equal.

Table 7. Mean disfluency rates in lecture and interviews.

Discipline	***Mean disfluency rate (disfluencies/minute) ± S.D. during:***		***Disfluency Ratio of Lectures to Interviews***
	Lectures	***Interviews***	
Medicinal chemistry	2.27 ± 0.81	8.21 ± 1.79	0.28
Pharmaceutics	1.80 ± 0.43	8.85 ± 2.98	0.20
Pharmacology	2.74 ± 0.93	7.54 ± 2.92	0.36
SAdS	1.28 ± 1.30	3.87 ± 1.30	0.33
Pharmacy practice	1.44 ± 0.34	5.16 ± 1.63	0.28

Figure 2. Disfluencies per minute during lectures and interviews in (1) medicinal chemistry, (2) pharmaceutics, (3) pharmacology, (4) pharmacy practice, and (5) pharmacy administration.

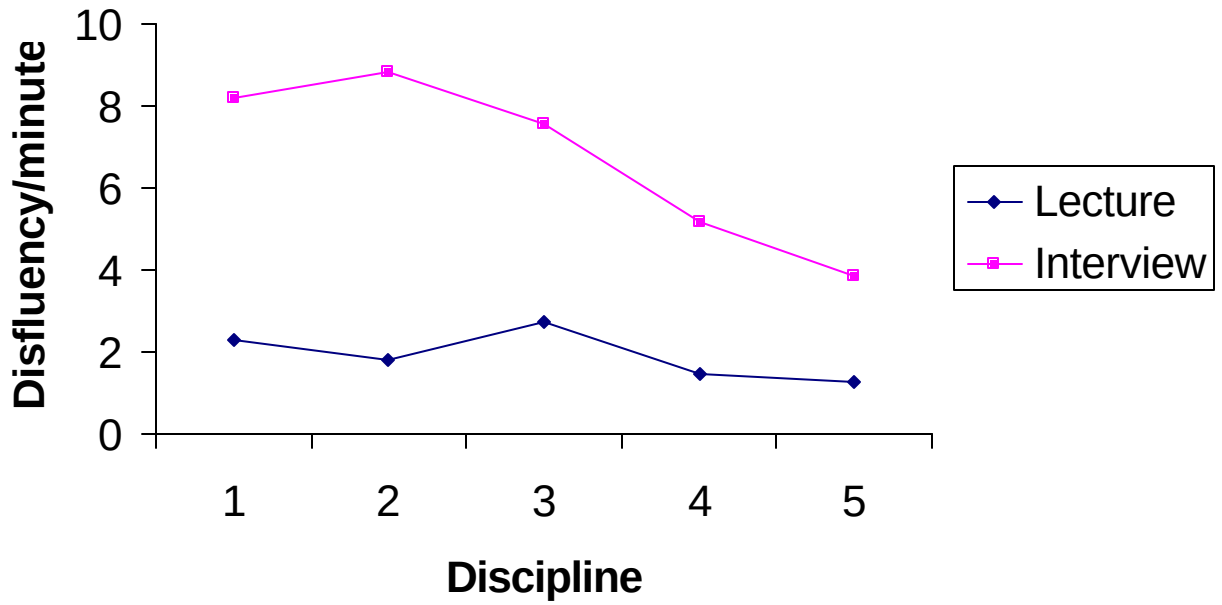


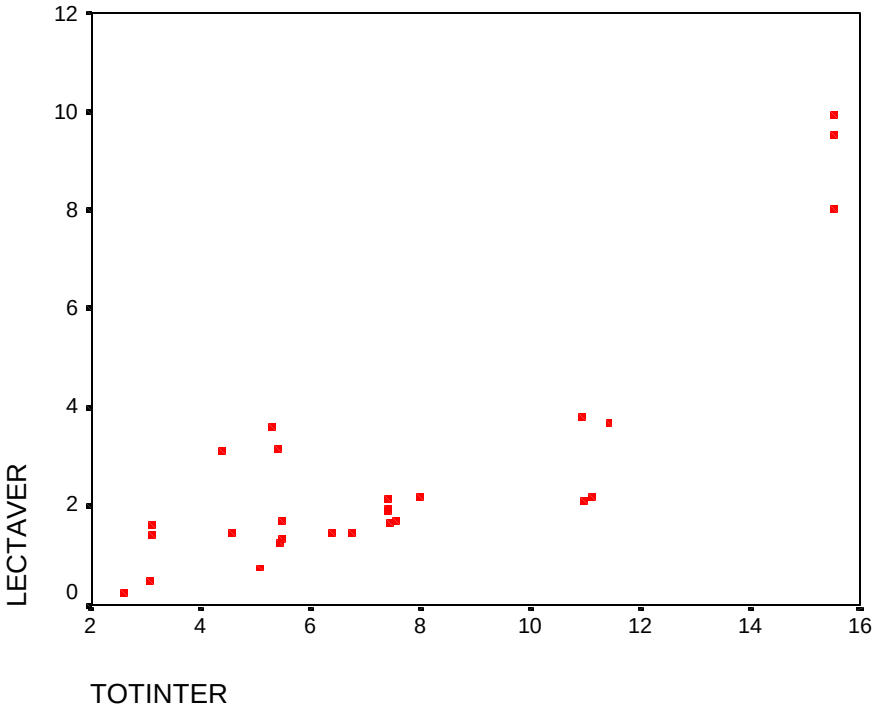
Table 8 reveals mean disfluency rates in each of the subdisciplines before and after adjusting for subjects' inherent disfluency rates as a result of ANCOVA procedures. After controlling for inherent disfluency rates, no differences were found in disfluency rates in the five disciplines ($F = 1.45$, $df = 4$, $p = 0.259$). This model accounted for 47% of the variation of disfluency rates in lectures at a power of 0.36. Subjects' inherent interview disfluency rate and their disfluency rate in the classroom were strongly related ($r = 0.83$, $p = 0.000$); see figure 3. Lecturer's disfluency rate in natural speech accounted for 27% of the variance in their classroom disfluency rate.

Table 8. Mean disfluency rate in lectures before and after adjusting for subjects' inherent disfluency rate, and results of ANCOVA.

Discipline	***Mean disfluency rate (disfluencies/minute) in lectures***	***Adjusted disfluency (disfluencies/minute) rate in lectures***
Medicinal chemistry	2.27	2.01
Pharmaceutics	1.80	1.45
Pharmacology	2.74	2.59
SAdS	1.28	1.67
Pharmacy practice	1.44	1.63

	Sum of Squares	***df***	***Mean Square***	***F***	***Sig***
Disciplines	3.405	4	0.851	1.406	0.283

Figure 3. Plot of subjects' interview disfluency rate against their lecture disfluency rate.



E. Effects of fear of negative evaluation

Subjects' mean responses to the modified Brief-FNE instrument are provided in Table 9. On an instrument whose possible scores range from 12 to 60, the total mean score is 31.75. Item 2, "It does not bother me if I know that students are forming an unfavorable impression of me during lecture" received the highest fear rating at 3.78, above the median score of 3 on a 5-point scale. Item 8, "I often worry I will say the wrong things during lecture" received the lowest average rating at 1.74

Table 9. Modified Brief-FNE items and mean subjects' responses.

Scale Items	***Mean ± SD***
1. I worry about what students are thinking of me while I am lecturing.	2.56 ± 1.12
2. It does not bother me if I know that students are forming an unfavorable impression of me during lecture. ***(R)***	3.78 ± 1.09
3. I am frequently afraid of students noticing my shortcomings during class.	1.85 ± 0.82
4. I rarely worry about what kind of impression I am making on students. ***(R)***	3.63 ± 1.28
5. I am afraid that students will find fault with me.	1.85 ± 0.72
6. Student's opinions of me do not bother me. ***(R)***	3.71 ± 0.86
7. Sometimes I think I am too concerned with what students think of me.	2.11 ± 1.09
8. I often worry I will say the wrong things during lecture.	1.74 ± 1.02
9. Sometimes I worry that students will find my teaching style ineffective.	2.22 ± 1.09
10. If I know students are judging me, it has little effect on me. ***(R)***	3.48 ± 1.12
11. I worry that students will not like me as much as their other teachers.	1.89 ± 0.97
12. I frequently worry about how students will rate my performance on teaching evaluations.	2.04 ± 1.06
Mean Total	31.75 ± 7.50

Items 2, 4, 6, and 10 were the only items whose average score was found to fall above a median score of "3 – *Moderately* characteristic of me" ranging between 3.48 and 3.78. Means for the remaining eight items fell below the median score, ranging between 1.74 and 2.56. Interestingly, these four items are reverse coded. This does not necessarily suggest, however, that subjects encountered difficulty when attempting to respond to these items or did not notice the reverse wording in the items. It is possible that the general nature of the circumstances in these items relative to the specifity of other items in the scale prompted a greater proportion of subjects to perceive fear of evaluation in these situations. Additionally, the median score "3" was not selected by respondents more than one-third of the time for any one item. This may be an encouraging observation in light of the fact that median scores sometimes provide a "statistical dumping ground" for ambiguity.

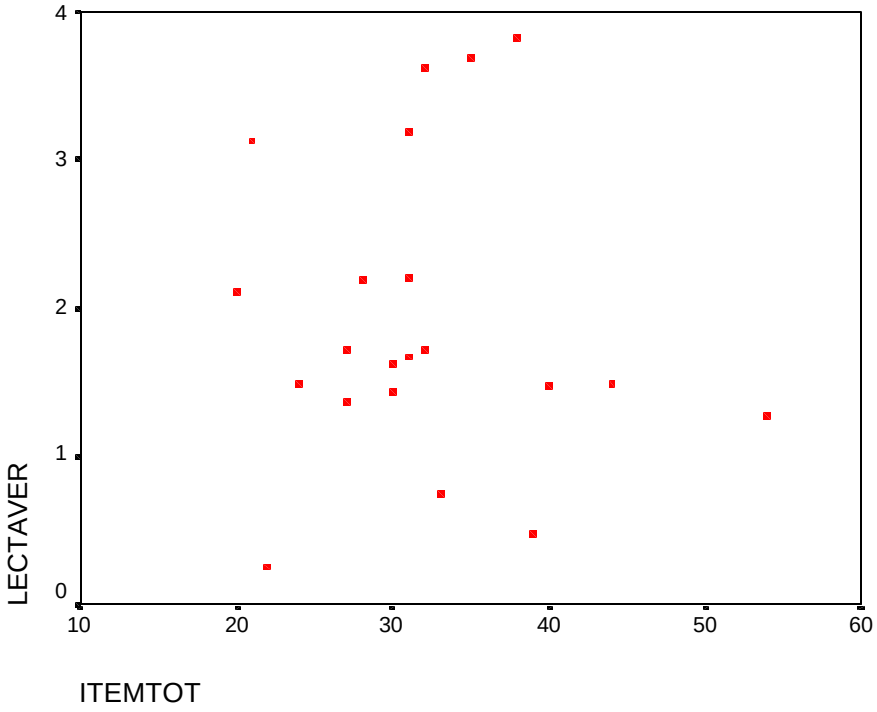
Cronbach's alpha coefficient was calculated for the modified Brief-FNE to determine the internal consistency of the instrument. The inter-item correlation for the instrument was 0.85. Items 2 – "It does not bother me if I know that students are forming an unfavorable impression of me during lecture" and 10 – "If I know students are judging me, it has little effect on me", were found to exhibit the lowest item-total correlations (0.22 and 0.09, respectively) and were removed in an attempt to improve the internal consistency of the instrument. After removing these items, the inter-item correlation increased to 0.88. In examining these two items further, it appears that these may be simply be concerns that actually fall short of measuring the fear of negative evaluation construct. For example, a professor may still be bothered if they know students are making unfavorable impressions of them during lecture or know that students are judging

them, even if they are not overly fearful of students' evaluations of them. However, noting the small increase in inter-item correlation from 0.85 to 0.88 upon removal of the two items from the instrument, all items were retained in the final instrument. Item responses should be interpreted with caution, as the small sample size precludes any efforts to validate the ability of this instrument to measure fear of negative evaluation.

Modified Brief-FNE scores were plotted against disfluency rates to determine the nature of the relationship between these variables prior to selecting an appropriate correlation procedure (Figure 4). The distribution of the two phenomena appears to be normal. Additionally, the relationship between the variables appears linear, making Pearson's correlation coefficient an appropriate procedure for determining correlation. Use of this procedure however, required the removal of outlier cases (described earlier in this section) to prevent a misleading correlation coefficient. The resulting correlation was not significant ($r = -0.060$, $p = 0.795$). Contrary to previous studies reporting a high level of fear of negative evaluation in subjects observed to have high disfluency rates,[156,183-185] there does not appear to be an association between these two variables in this particular sample. These results should be interpreted with caution, however, as fear of negative evaluation was measured with an instrument that was validated with a small convenience sample and used on a relatively small sample of subjects. In addition to determining the relationship between modified Brief-FNE scores and classroom disfluency rates, attempts were made to determine the relationships between these scores and subjects' age and teaching experience. It would be expected that those subjects who were older or had more teaching experience would indicate less fear of evaluation by students. Correlations of modified Brief-FNE scores with subject age and teaching

experience indicated non-significant relationships among these variables (r = -0.264, p = 0.248 and r = -0.250, p = 0.275). Despite the weak relationships among these variables, their similar correlation may provide some additional support for the validity of the modified Brief-FNE instrument; as age and teaching experience are highly interdependent (r = 0.76, p = 0.000). Although not an objective, the investigator attempted to determine if differences existed in Modified Brief-FNE scores among the five subdisciplines of pharmacy. Results of a one-way ANOVA indicated that no differences in self-rated fear of negative evaluation existed among the subdisciplines studied (F = 0.304; df = 4,20; p = 0.871).

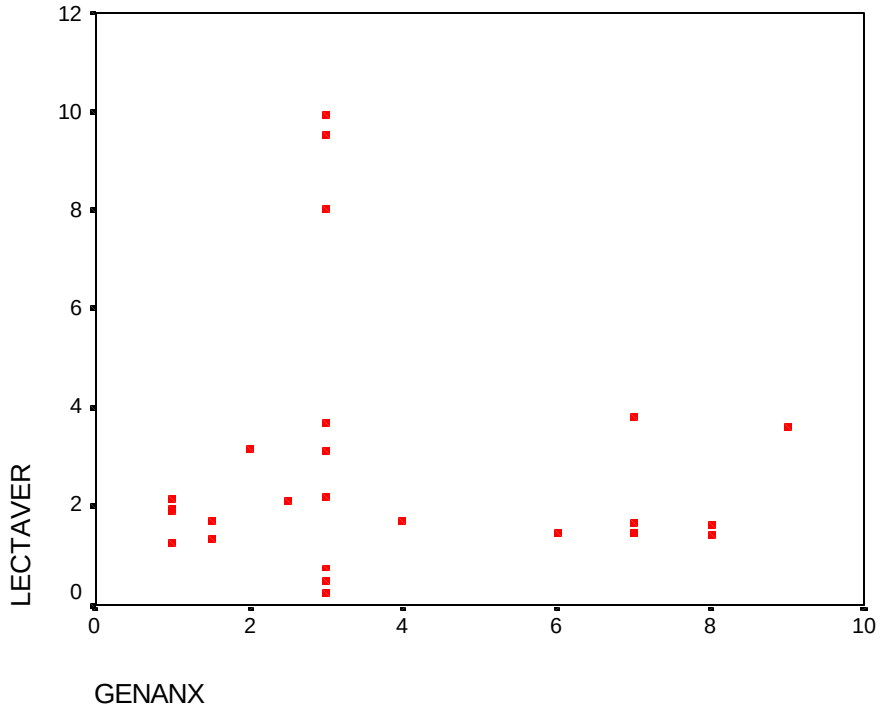
Figure 4. Plot of subjects' modified Brief-FNE total score against their disfluency rate in lecture.



F. Effects of general anxiety

On an instrument whose possible score range from 1 to 10, subjects' mean response to the general anxiety scale was 3.9. The median and mode of subjects' responses to this scale were 3.0. As with Brief-FNE scores, general anxiety scores were plotted against disfluency rates to determine the nature of the relationship between these variables before selecting an appropriate correlation procedure (Figure 5). Each of the variables appears to be normally distributed. Additionally, the relationship between these variable appears linear (rather than non-linear), making Pearson's correlation coefficient an appropriate procedure for determining correlation. This procedure also required removal of outlier cases to prevent a misleading correlation coefficient. The resulting correlation was not significant ($r = 0.14$, $p = 0.523$), suggesting no relationship between general anxiety and disfluency rate.

Figure 5. Plot of subjects' general anxiety score against their disfluency rate in lecture.



G. Summary of results

Based on these findings, it does not appear that type of discipline, or subjects' institution of employment, gender, age, undergraduate degree, and teaching experience are related to disfluency rates in the classroom. Additionally, subjects' self-rated level of anxiety and fear of negative evaluation was found to be unrelated to subjects' classroom disfluency rates. After controlling for subjects' natural disfluency rates, no differences were found in classroom disfluency rates among the disciplines studied. There did, however, appear to be a strong relationship between subjects' natural disfluency rates and their disfluency rates in the classroom. Finally, these results should be interpreted in light of the sample size under study (n = 31).

V. DISCUSSION

A. Limitations

This study is exploratory in nature as it one of the few studies to examine disfluency rates in the classroom, and the first study to measure disfluency rates in pharmacy subdisciplines. It is important to note that there are a limited number of pharmacy school programs and courses relative to courses offered in the sciences and humanities offered at most colleges and universities. This limitation, combined with the arduous nature of data collection and analysis procedures resulted in a relatively small sample size (n = 31) for this study. The power (or, probability of rejecting a null hypothesis when it is false) of the ANCOVA used to test for differences in speech disfluency rates in this study was 0.36. While this power is relatively low, it is important to remember that this study was exploratory, and no hypotheses were made. In light of these limitations, the reported findings should be interpreted with caution. Additionally, data collection was limited to four pharmacy schools in the region; therefore, this speech corpus is not nationally representative of all schools of pharmacy. It is possible that different regions across the country utilize speech patterns or dialects that may extend to pharmacy schools, themselves. Thus, these regions may encompass different rates of speech disfluency that were not considered in this study. It is also important to note that only one subject reported speaking a native language other than English. While the sampling frame may have contained more foreign-born lecturers, they were either not sampled, or did not consent to study participation. Concerns over these limitations may be ameliorated by the fact that the study controlled for subjects' inherent disfluency rates. Additionally, pharmacy school faculty are commonly comprised of members who hail

from national and international venues, hence, a typical pharmacy school is not likely to encompass a geographically homogeneous faculty.

There may be limitations associated with obtrusive observation during the data collection process. Although careful attention was made to ensure that all subjects were unaware of the study hypothesis, it is possible the obtrusive observation may have lead to a *Hawthorne effect*, or altered behavior in the lectures. In obtaining consent for study participation, it was necessary to inform the subjects that the purpose of this study would be to observe "linguistic components" of pharmacy lectures. While this statement did not reveal the specific nature of the data collected, it is possible that obtrusive observation and audio recording may have to lead altered behavior and a even potential alteration in a lecturer's typical classroom disfluency rates. For example, presence of an observer may have caused increased anxiety for some subjects or caused others to be more conscious of *what* they said or *how* they said something. While anxiety did not appear to affect disfluency rates in this study, these factors may potentially affects rates in some individuals. Schachter circumvented the Hawthorne effect by sending college students to classrooms to inconspicuously serve as data collectors unbeknownst to instructors.[59] It is the investigator's contention, however, that ethical considerations in obtaining data of this nature supercedes any risk of altered teaching behaviors. Additionally, all participating IRBs required extensive written consent procedures for granting study approval.

Speech disfluency rates in this study were measured in terms of *disfluencies per minute*. This rate expression, however, does not control for the *number* of words spoken during lectures. It may have been more accurate to measure disfluency rates in terms of

disfluencies per 100 words. While Schachter reported disfluency rates in terms of disfluencies per minute, he attempted to determine the accuracy rate by sampling the first five minutes of each of his recordings and measuring rates of those samples in terms of disfluencies per 100 words.[59] Schachter conducted an ANOVA procedure among the disciplines using these rate terms, and found precisely the same differences among the disciplines that he formerly reported in disfluencies per minute. Additionally, Schachter reported a high correlation between these two rate expressions ($r = 0.97$). It appears, then, that expressing disfluency rates in terms of disfluencies per minute is acceptable for this study.

Finally, this study design did not account for the amount of preparation time that subjects invested into their lecture or the presentation format they utilized (e.g., conducting a Power Point presentation, reading from a handout or outline, writing on the board, utilizing transparencies, or no teaching aid). Ostensibly, these phenomena may account for differences in speech disfluency rates. At best, the investigator can report from observation that the majority of lectures in all disciplines were taught with the aid of transparencies or Power Point (Table 10). Among these two presentation methods, the use of a particular presentation method did appear to differ considerably among the disciplines. While this does not conclusively suggest that various presentation methods do not affect speech disfluency rates, it may begin to ameliorate concerns over the effects of teaching aids on disfluency rates.

Table 10. Proportion and frequency of use of teaching aids in five subdisciplines of pharmacy

Discipline	***Transparency***	***Power Point***	***Whiteboard***	***Handout/outline***	***No teaching aid***
Medicinal chemistry	37.5%	50.0%	12.5%		
	(3)	***(4)***	***(1)***		
Pharmaceutics	40.0%	20.0%	40.0%		
	(2)	***(1)***	***(2)***		
Pharmacology	33.3%	50.0%		16.67%	
	(2)	***(3)***		***(1)***	
SAdS	25.0%	50.0%			25.0%
	(1)	***(2)***			***(1)***
Pharmacy practice	12.5 %	62.5%		12.5%	12.5%
	(1)	***(5)***		***(1)***	***(1)***
Total	***9***	***15***	***3***	***2***	***2***

B. Discussion of results

Mean disfluency rates in the subdisciplines ranged from 1.28 to 2.74. When comparing these findings to those of Schachter, it appears that these rates fall between those of the natural sciences (1.39) and social sciences (3.84) (Table 11). When comparing these findings, however, it is important to note that this study accounted for three types of disfluencies; filled pauses, repeats and restarts. Therefore, rates reported in this study may actually appear somewhat higher when compared to disfluency rates in the natural sciences, social sciences and humanities.

Table 11. Mean disfluency rates in the pharmacy subdisciplines, natural sciences, social sciences and humanities.

Pharmacy Subdisciplines		***Schachter[59]***	
Discipline	***Disfluencies/minute***	***Discipline***	***Disfluencies/Minute***
Pharmacology	2.74	Natural sciences	1.39
Medicinal chemistry	2.26	Social sciences	3.84
Pharmaceutics	1.80	Humanities	4.85
Pharmacy practice	1.44		
Pharmacy administration	1.28		

Although generalizability of results is limited, it does not appear that subjects' institution of employment, gender, age, undergraduate degree, or teaching experience had an effect on disfluency rates in the classroom. These findings corroborate those of other studies that have examined the role of demographic characteristics like age and gender on disfluency rates. To date, there is little more than tenuous evidence to suggest that these variables affect disfluency rates.[138,158-161]

The investigator assessed subjects' self-rated level of anxiety and fear of negative evaluation by students to determine if psychodynamic factors demonstrated a relationship with disfluency rates. Although anxiety was measured using a single item, the finding that disfluency rates and anxiety were not correlated corroborates the findings of many studies employing multi-dimensional measures of anxiety. While there is strong evidence that many speech disfluencies increase with anxiety,[167-177] there is little to no evidence that *filled pauses* are affected by anxiety.[167,169,170,174,175,177] It is important to note, however that this measure was utilized in light of its minimal response burden on subjects. Indeed, there exists many multidimensional measures of anxiety (both state and trait) such as the State-Trait Anxiety Inventory (STAI)[198] whose use may have resulted in a different relationship between anxiety and speech disfluency than that which was found here.

There is stronger evidence to suggest that fear of negative evaluation by others affects disfluency rates in speakers.[156,183-185] However, studies to date have measured fear of negative evaluation in the social context, only. Few, if any, efforts have been made to add situational characteristics to fear of negative evaluation, as was done in this study, before evaluating its impact on speech disfluency rates. Results of this study

suggest that subjects' fear of negative evaluation by students is not correlated with classroom disfluency rates.

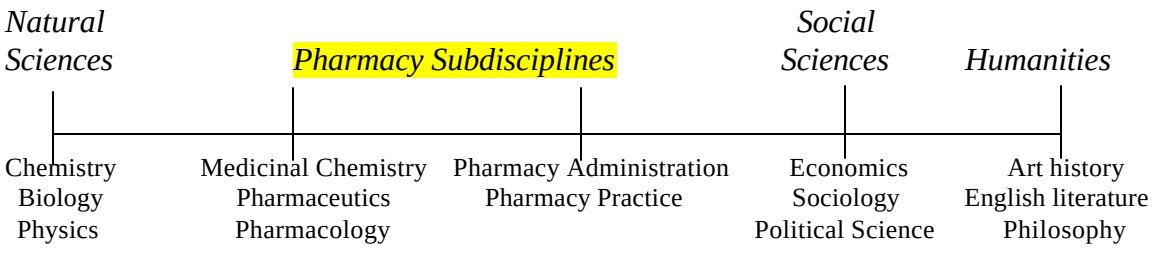
The fact that subjects' self-rated anxiety and fear of negative evaluation was not correlated does not necessarily suggest that there is no relationship between these psychodynamic indicators and disfluency. It may be some subjects' response to be more conscious of their speech if they are feeling anxious or worried about the impression they are making on students. It may be others' reaction, however, to exhibit higher disfluency rates if they are feeling anxious or are worried about the impression they are making on students. Both of these phenomena at work may help to explain the lack of correlation between anxiety or fear of negative evaluation and lecture disfluency rates.

Finally, disfluency rates were not found to differ among the disciplines, even after controlling for subjects' inherent, or natural disfluency rates. Additionally, there was a strong relationship between subjects' natural disfluency rates and lecturing disfluency rates. These results differ markedly from those reported by Schachter, whereby significant differences in disfluency rates were identified among the natural sciences, social sciences and humanities, even after controlling for subjects' inherent disfluency rates (Table 10). It is important to note that the strong relationship between inherent and lecture disfluency rates do not disprove the argument that disfluencies are a result of higher planning load. If, in fact, there were found to be significant differences among the disciplines even after controlling for natural disfluency rates, it is still possible to have a strong relationship between natural and classroom speech rates.

The results of this study may demonstrate that pharmacy subdisciplines are not as disparate in their paradigm development as are the natural sciences, social sciences and

humanities. In other words, on the "hard-soft" continuum, the gap between SAdS and medicinal chemistry may not be as great as that which exists between the social scientist and physical sciences not affiliated with professional degree programs. An example of this continuum is provided in Figure 6. This illustration, however, is by no means a proposal of what the "hard-soft" continuum actually looks like, but mere provides a *visualization* of what is being described as a "narrower" gap between the subdisciplines. There does exist preliminary evidence of this phenomenon. Desselle and colleagues have reported that scholars in all five disciplines perceive at least a modest amount of consensus on teaching and research issues.[18,26] There are several reasons why this may be the case. If, in fact, there is a narrow gap between the subdisciplines, there are several reasons why the disparity in disfluency rates among pharmacy subdisciplines is so small, and demonstrate similar levels of development within their disciplines.

Figure 6. Continuum of high-consensus disciplines and low-consensus disciplines



Seventy-five percent of the subjects in this study held undergraduate degrees in pharmacy. While this study sample may not be representative of faculty in all schools of pharmacy, it is likely that many, if not most faculty in pharmacy schools are pharmacists by training. As a result, many faculty members have probably met similar educational competencies in their undergraduate training. Most likely, that training was comprised of courses in each of the subdisciplines of pharmacy. Additionally, most pharmacy faculty may have been trained in Ph.D. programs with a reasonably extensive focus on conducting independent research in one of the subdisciplines. Most importantly, they have been trained primarily in colleges and schools of pharmacy concomitantly with graduate students in other subdisciplines.

Additionally, medicinal chemists, pharmaceutical scientists, pharmacologists, SAdS, and pharmacy practice scholars, while specialized scientists on their own terms, will typically fall under the same auspices within their school of pharmacy. For example, although they pursue unique disciplines, scholars may be under similar expectations of scholarship, teaching and service, and may be asked to meet common objectives and competencies for undergraduate pharmacy students. Falling under the guise of a competency-based curriculum remains a phenomenon unique to programs in professional disciplines, and, in part, may explain why paradigms among the pharmacy subdisciplines is not as disparate as those in the natural sciences, social sciences, and humanities. This phenomenon is most clearly evident in recent efforts to utilize an interdisciplinary approach in education through the development of disease-based, integrated-design courses reflective of the recent transition to the entry-level PharmD program.[29-38] Interdisciplinary courses, typically including material from pathophysiology,

pharmacology, medicinal chemistry, pharmaceutics, clinical therapeutics, and most recently SAdS, are designed with the intent of developing pharmacy professionals with the ability to synthesize, evaluate, and incorporate new information in the clinical decision-making process for which they will be increasingly involved.[29,33,35-37] These efforts may necessitate intimate collaboration among scholars to achieve optimum and consistent competencies for their students. In some cases, this may even require the scholar to step outside the boundaries of their own discipline when teaching concepts to undergraduate students. For example, an interdisciplinary approach to teaching may require the medicinal chemist to not only describe the chemical action of a drug, but to describe subsequent implications for the patient.

Finally, while the SAdS do indeed borrow from formerly defined low-consensus disciplines such as sociology, psychology, communications, and anthropology, it is important to note that these social science disciplines are not represented to their fullest extent in the SAdS. In other words, while the SAdS borrow from many social science disciplines, they do not incorporate these sciences wholly in their purest form, but rather, they borrow those principles that can be applied to pharmacy practice. This phenomenon may further explain why paradigm in SAdS and other subdisciplines are not as disparate as those in the natural and social sciences.

Observing this interdisciplinary approach to teaching appeared to provide anecdotal support for the argument that disfluencies are a result of higher planning load. For example, when medicinal chemists and pharmacologists explained concepts in terms of their chemical and biological mechanisms, the investigator noted little disfluency in these explanations. However, when applying these mechanisms to pharmacy practice

(e.g. describing implications for the patient, side effects, patient counseling), there appeared to be a higher rate of speech disfluencies. Describing concepts beyond that of one's primary training may be associated with a higher planning load, and more options in phrases and speech. For example, a medicina1 chemist describing synthetic modification of endogenous steroids to separate mineralicorticoid and glucocorticoid effects may experience higher planning load when explaining that a patient is more likely to retain water due to mineralicorticoid effects. While the difference was not significant, it is important to note that pharmacology lectures had disfluency rates nearly twice that of pharmacy administration lectures. Such differences may lend credence to examining these anecdotal findings further.

This may not be overly problematic for basic scientists who are pharmacists by training. However, it is likely that some medicinal chemists and pharmacologists are not trained as pharmacists, but hold an undergraduate degree in chemistry, biochemistry or biology. In fact, the majority of subjects *not* holding pharmacy degrees in this study were medicinal chemists and pharmacologists. It is possible that these scholars experience higher planning load when describing pharmacy practice implications of their chemical or biological mechanisms.

Additionally, pharmacy administration scholars and pharmacy practice faculty are probably more likely to have undergraduate training in pharmacy, and possess graduate training in pharmacy practice, itself. Describing pharmacy practice concepts and implications for the patient fall into their "scholarly arena." Therefore, they may experience less planning load when describing these phenomena. It is interesting to note that while the disfluency rates among disciplines were not significantly different in this

study, pharmacy practice and pharmacy administration lectures did exhibit lower mean rates in disfluency than medicinal chemistry and pharmacology lectures. This finding, however, is anecdotal, and does not conclusively suggest that basic scientists experience higher planning loads when applying their science to practice.

Introductory level courses in chemistry, biology and physics may exhibit far less complexity at the undergraduate level than do basic sciences taught in professional programs like pharmacy. This complexity is largely due to the applicative nature of the science. It follows, then, that Schachter observed very low disfluency rates in introductory-level basic sciences relative to the rates reported in the basic sciences in this study.

Several recent studies in psychology and education have been concerned with the self-selection phenomenon.[203-208] Specifically, it has been argued that a scholar's decision to pursue a particular discipline may depend upon their personality type, worldview or scientific predilection.[209] In other words, it may be the nature of individuals pursuing a particular discipline, not the discipline, itself, that accounts for disciplinary differences. Babbage and Ronan recently administered a series of personality inventories to natural scientists to determine if these scientists differ in their worldview, scientific predilection, and personality. Their research demonstrated a link between personality, worldview and one's broader scientific pursuit (natural science vs. social science).

Babbage and Ronan argue that differences in worldview and personality are meaningfully related to scientific discipline, with individuals in the social sciences more organismically-oriented and individuals in the natural sciences more mechanistically-oriented.[209] In other words, social scientists were found to be more intellectual, aesthetic,

intuitive, innovative, and socially skilled. When correlating these traits with personality measures, organismic individuals were found to be more open to new experiences, to have a broader variety of interests, to be more imaginative, compassionate, good-natured and eager to cooperate. Being more mechanistically-oriented, natural scientists were found to be more concrete, down-to-earth, sense-oriented, ordinary, and socially hesitant. When correlating these traits with personality measures, mechanistic individuals were found to be more practical, hardheaded, skeptical, proud, and competitive.

It appears that there is evidence to suggest that certain personalities may be drawn to certain disciplines. Indeed, this may be the case when considering very disparate disciplines such as physics and art history, or chemistry and English. However, once one has elected to pursue scholarship in pharmacy, self-selection may play little, if any role in one's gravitation towards one of the subdisciplines. If, in fact, one chooses to pursue scholarship and teaching in pharmacy, it is likely (but not always necessary) that they pursued undergraduate training in pharmacy. At this point, self-selection may have played a role in this decision. As a result, the scholar would be well versed, at least at an introductory level, in all of the subdisciplines. Additionally, while the disciplines may differ in scientific approaches and theory, the still share a common goal in applying scientific theory to pharmacy practice. Therefore, selecting a subdiscipline of study may be a result of other influences. Indeed, there are anecdotal accounts whereby scholars once pursued subdisciplines at the post-graduate level that are different from the discipline they are currently pursuing. The fact that no significant differences in disfluency rate were observed among the disciplines concurrent with the high correlation

between natural and classroom disfluency rates suggests that within pharmacy subdisciplines, there may be little incidence of self-selection into these disciplines.

C. Implications of results

In part, results of this study may suggest that the "younger" subdisciplines of pharmacy (pharmacy administration and pharmacy practice) are making strides towards achieving their paradigm development. However, findings of this study do not negate previous evidence suggesting that these disciplines have yet to reach their scientific paradigms. Desselle and colleagues have reported that pharmacy scholars' mean rankings afforded to subdisciplines in achieving their scientific paradigms were significantly higher for medicinal chemistry, pharmacology, and pharmaceutics as compared to pharmacy practice and SAdS.[18] In other words, respondents felt that the former disciplines have developed more structured paradigms. This may suggest that pharmacy scholars perceive pharmacy practice and SAdS to be lagging behind the other three disciplines studied.[18] This perception that may be mitigated, however, through SAdS and pharmacy practice scholars' promotion of the valuable research contributions they make.[18]

When Desselle and colleagues asked scholars to identify what issues/concepts are most important to teach entry-level students and what issues/problems are most important to research, pharmacy practice and the social and administrative sciences demonstrated less focused research agendas than did their colleagues in medicinal chemistry, pharmacology, and pharmaceutics. This may provide further evidence that the former disciplines exhibit less developed paradigms. This finding may also, however, be a result of the nature of the disciplines; whereby pharmacy practice and pharmacy administration

incorporate many specialties within their disciplines that are more widely decompartmentalized than those in other pharmacy subdisciplines. For example, pharmacy practice incorporates disciplines such as geriatric practice, endocrinology, and critical care, and pharmacy administration requires the borrowing of theory from variety of disciplines such as economics, psychology and communications.

If, in fact, basic scientists were experiencing increased planning load as a result of applying mechanisms to practice, this may have implications for the current climate of pharmacy education. This study has not provided evidence that lectures were experiencing increased planning load, but the implications of such a phenomenon are worth noting. As the shortage of pharmacists grows ever more apparent,[214-216] so too does the shortage of pharmacy faculty.[217] Faculty shortages are not only the result of pharmacy graduates being drawn to practice and dispensing functions, but are also a result of the emergence of new pharmacy school intended to meet the increasing demand for pharmacists in the next decade. In the meantime, faculty members may find themselves instructing courses and teaching concepts that extend the boundaries of their own specializations. For example, pharmacy administration faculty may be called upon to teach practice-related courses, while pharmacy practice faculty may be called upon to teach biopharmaceutics or pharmacokinetics-related courses. As a result, it becomes necessary that scholars have developed competencies beyond the focus of their own discipline

Organizations have acknowledged the importance of applying scholars' scientific specializations to practice. Professional pharmacy organizations such as the American Pharmacists Association (APhA) and the American Council of Pharmaceutical Education

(ACPE) are beginning to recognize the importance in recruiting faculty with training in pharmacy. Policies are currently being developed to encourage the hiring of faculty who are pharmacists by training, and developing programs to socialize into the profession those faculty members who do not have pharmacy training.[218]

D. Future Research

While disfluency rates may serve as a proxy measure of disciplines' paradigm development, this measure is only one of many measures required to grasp a compete picture of discipline's paradigm development. The fact that no differences were found among disciplines may suggest that they do indeed have similar paradigms, or it may suggest that speech disfluency is not an optimal measure when attempting to determine paradigm development in pharmacy disciplines. Future research should explore other dimensions that have served as valid measures of paradigm development in disciplines outside of pharmacy. One of these measures may include a comparative study of dissertation lengths among the subdisciplines. Accordingly, dissertations in low-consensus disciplines have been found to longer in order to dedicate more space towards "establishing the literature."[43] Further examination into journal rejection rates and particularism among journals may provide further insight into the level of paradigm development among subdisciplines of pharmacy. Likewise, exploring patterns of funding and productivity among the disciplines may serve as an indicant of paradigm development. As a result of the potential disparity in the abovementioned indices of paradigm development, it is worthy to explore disparities in optimism, pessimism, and stress among pharmacy faculty.

Examining factors like optimism, pessimism and stress among faculty is a timely pursuit. Just as teaching and scholarship are susceptible to the effects of consensus, having achieved consensus or "scientific progress" may have implications on how faculty members view teaching and research and ultimately how they handle stress and adjust to their roles.[1] Therefore, it is critical to not only assess pessimism and stress among pharmacy faculty, but to determine if differences exist among subdisciplines. Pharmacy faculty may be particularly susceptible to stress, given the constant flux of entry-level curricula.[26] Additionally, new pharmacy faculty members are challenged by the requirement of attaining at least some level of understanding of pharmacy's other disciplines, each of which are unique in their maturity, their application of pure versus applied science, or biological versus non-biological science.[54] This may be exceptionally problematic for those new faculty members not formally trained as pharmacists, but as social or basic scientists.[54]

E. Conclusions

Compared to variable disfluency rates that have identified in the natural sciences, social sciences, and humanities, no difference in disfluency rates was noted among the subdisciplines of pharmacy. Although subjects' natural disfluency rates were found to be highly correlated with their classroom rates, this does not disprove the theory that disfluencies are a result of planning load. Lack of differences in disfluency rate relative to that of other disciplines outside of pharmacy may be attributed to the nature of pharmacy as a discipline. As pharmacy faculty are likely to have similar undergraduate educations, have trained together as graduate students, and fall under the same auspices within their pharmacy school, the gap of paradigm development within the disciplines

may not be as disparate as those found outside the professional discipline of pharmacy. Whether or not subdisciplines exhibit similar paradigm development may have implications for not only the scholars themselves, but for the professional students who are trained under their guise. To date, the examination of paradigm development within the subdisciplines remains incomplete. Further exploration into this phenomenon is necessary to develop a complete picture of paradigm development within pharmacy's academic subdisciplines.

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APPENDIX A

Written consent for study participation

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Investigator:

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Source of Support:

This study is being performed as partial fulfillment of the requirements for the master's degree in Pharmacy Administration at Duquesne University and supported by a grant from Pfizer, Inc.

Purpose:

You are being asked to participate in a lecture observation study that seeks to investigate the linguistic components of pharmacy lectures in courses related to medicinal chemistry, pharmaceutics, pharmacology, social and administrative sciences, pharmacy practice, and their related sciences. Your course has been selected via stratified random sampling procedure. Specifically, the investigator will be observing the use of, or lack of use of, certain utterances and terminology during these observed lectures.

Fulfillment of study protocol will require the following data to be collected:

1. The observation and audio recording of two lectures during the fall semester;
2. a 15-minute interview, audio recorded and scheduled at the lecturer's convenience;
3. the collection of demographic data;
4. a rating of the participant's general level of anxiety,
5. and the completion of a modified version of the Brief Fear of Negative Evaluation Scale (Brief-FNE, 12 items).

Risks and Benefits:

The investigator does not anticipate any risk to study participants. While direct benefit to participants is not expected, it is hoped that research results will aid in advancing the state of education and research in the pharmaceutical sciences.

Compensation:

Participants will not be compensated. However, participation in the project will require No monetary cost to you.

Confidentiality:

Please be assured that your identity will not be considered in any phase of this project. Additionally, data obtained will be evaluated collectively with data obtained from other lectures among four schools of pharmacy. By no means will this observation study be an assessment of any aspect of a lecturer's teaching style or lecture content either individually or collectively. Each participant will be assigned an identification number. *The participants' name will never be used as an identifier or for any other purpose at any point during the study.* The identification number will be used on all pieces of data (including recordings) related to that participant throughout the data collection phase of the study. At the conclusion of data collection and prior to database entry and analysis, identifying numbers will be edited from audio recordings and blacked out on paper data. Following the completion of analysis, all paper data will be shredded, and digitally recorded audio data will be erased. Again, results of this study will be reported collectively, as 80 total lectures will be observed per protocol.

Right to Withdraw:

You are under no obligation to participate in this study. You are free to withdraw your consent to participate at any time with subsequent destruction of your data.

Summary of Results:

A summary of the results of this research will be supplied to you, at no cost, upon request.

Voluntary Consent:

I have read the above statement and understand what is being requested of me. I also understand That my participation is voluntary and that I am free to withdraw my consent at any time, for any reason. On these terms, I certify that I am willing to participate in this research project.

I understand that should I have any further questions about my participation in this study, I may Call Dr. Paul Richer, Chair of the Duquesne University Institutional Review Board (412-396-6326), Erin Holmes (investigator, 412-396-1982) or Dr. Shane Desselle (advisor, 412-396-6363).

_____

Participant's Signature Date

_____

Researcher's Signature Date

Voluntary Consent:

I have read the above statement and understand what is being requested of me. I also understand that my participation is voluntary and that I am free to withdraw my consent at any time, for any reason. On these terms, I certify that I am willing to participate in this research project.

I understand that should I have any further questions about my participation in this study, I may Call Dr. Paul Richer, Chair of the Duquesne University Institutional Review Board (412-396-6326), Erin Holmes (investigator, 412-396-1982) or Dr. Shane Desselle (advisor, 412-396-6363).

_____

Participant's Signature Date

_____

Researcher's Signature Date

APPENDIX B

Data Collection Forms

COLLECTION FORM A: DEMOGRAPHIC INFORMATION

1. DISCIPLINE:
   _____ MEDICINAL CHEMISTRY
   _____ PHARMACEUTICS
   _____ PHARMACOLOGY
   _____ SOCIAL & ADMINISTRATIVE SCIENCES
   _____ PHARMACY PRACTICE

2. GENDER _____ M _____ F

3. AGE _____

4. NATIVE LANGUAGE _____

5. UNDERGRADUATE DEGREE _____

6. TOTAL YEARS TEACHING _____

7. NUMBER OF SEMESTERS TEACHING COURSE _____

8. NUMBER OF TIMES COURSE HAS BEEN OFFERED _____

9. APPROXIMATE NUMBER OF STUDENTS IN CLASS _____

DATA COLLECTION FORM B: LECTURE 1

1. DISCIPLINE:
   _____ MEDICINAL CHEMISTRY
   _____ PHARMACEUTICS
   _____ PHARMACOLOGY
   _____ SOCIAL & ADMINISTRATIVE SCIENCES
   _____ PHARMACY PRACTICE

2. DATE & TIME OF EVALUATED COURSE _____

3. CODING TIME _____ MINUTES _____ SECONDS

4. TOTAL # SPEECH DISFLUENCIES _____ (SEE ATTACHED TALLY SHEET)

DATA COLLECTION FORM B: LECTURE 1 (CON'T)

1. DATE & TIME OF EVALUATED COURSE _____

2. TALLY OF SPEECH DISFLUENCIES:

DATA COLLECTION FORM C: LECTURE 2

1. DISCIPLINE:
   _____ MEDICINAL CHEMISTRY
   _____ PHARMACEUTICS
   _____ PHARMACOLOGY
   _____ SOCIAL & ADMINISTRATIVE SCIENCES
   _____ PHARMACY PRACTICE

2. DATE & TIME OF EVALUATED COURSE _____

3. CODING TIME _____ MINUTES _____ SECONDS

4. TOTAL # SPEECH DISFLUENCIES _____ (SEE ATTACHED TALLY SHEET)

DATA COLLECTION FORM C: LECTURE 2 (CON'T)

1. DATE & TIME OF EVALUATED COURSE _____

2. TALLY OF SPEECH DISFLUENCIES:

DATA COLLECTION FORM D: INTERVIEW

1. DISCIPLINE:
   _____ MEDICINAL CHEMISTRY
   _____ PHARMACEUTICS
   _____ PHARMACOLOGY
   _____ SOCIAL & ADMINISTRATIVE SCIENCES
   _____ PHARMACY PRACTICE

2. DATE & TIME OF INTERVIEW _____

3. CODING TIME _____ MINUTES _____ SECONDS

4. TOTAL # SPEECH DISFLUENCIES _____ (SEE ATTACHED TALLY SHEET)

DATA COLLECTION FORM D: INTERVIEW (CON'T)

1. DATE & TIME OF INTERVIEW _____

2. TALLY OF SPEECH DISFLUENCIES:

APPENDIX C

Modified Version of the Brief Fear of Negative Evaluation Scale (Brief-FNE)

Please read each of the following statements carefully and indicate how characteristic it is of you according to the following scale:

1 = *Not at all* characteristic of me
2 = *Slightly* characteristic of me
3 = *Moderately* characteristic of me
4 = *Very* characteristic of me
5 = *Extremely* characteristic of me

(1) I worry about what students are thinking of me while I am lecturing	1	2	3	4	5
(2) It does not bother me if I know that students are forming an unfavorable impression of me during lecture. **(R)**	1	2	3	4	5
(3) I am frequently afraid of students noticing my shortcomings during class.	1	2	3	4	5
(4) I rarely worry about what kind of impression I am making on students.**(R)**	1	2	3	4	5
(5) I am afraid that students will find fault with me.	1	2	3	4	5
(6) Student's opinions of me do not bother me. **(R)**	1	2	3	4	5
(7) Sometimes I think I am too concerned with what students think of me.	1	2	3	4	5
(8) I often worry I will say the wrong things during lecture.	1	2	3	4	5
(9) Sometimes I worry that students will find my teaching style ineffective.	1	2	3	4	5
(10) If I know students are judging me, it has little effect on me. **(R)**	1	2	3	4	5

(11) I worry that students will not like me as much as their other teachers. 1 2 3 4 5

(12) I frequently worry about how students will rate my performance on teaching evaluations. 1 2 3 4 5

APPENDIX D

Subjective anxiety scale

*All of us experience some degree of anxiety occasionally, in part due to stresses brought on by professional and work-related issues, family, personal, or health-related issues. Considering these aspects of your life, please rate on a scale from 1-10, the level of anxiety you **generally** feel on a day-to day basis. Please do not indicate a level of anxiety brought about by a specific event. Please circle a number below.*

1	2	3	4	5	6	7	8	9	10
Not at all Anxious									*Extremely Anxious*

APPENDIX E

Brief Fear of Negative Evaluation Scale (Brief-FNE)

Read each of the following statements carefully and indicate how characteristic it is of you according to the following scale:

1 = Not at all characteristic of me
2 = Slightly characteristic of me
3 = Moderately characteristic of me
4 = Very characteristic of me
5 = Extremely characteristic of me

(1) I worry about what other people think of me even when I know it doesn't make any difference.	1	2	3	4	5
(2) I am unconcerned even if I know people are forming an unfavorable impression of me. **(R)**	1	2	3	4	5
(3) I am frequently afraid of other people noticing my shortcomings.	1	2	3	4	5
(4) I rarely worry about what kind of impression I am making on someone. **(R)**	1	2	3	4	5
(5) I am afraid that others will not approve of me.	1	2	3	4	5
(6) I am afraid that people will find fault with me.	1	2	3	4	5
(7) Other people's opinions of me do not bother me. **(R)**	1	2	3	4	5
(8) When I am talking to someone, I worry about what they may be thinking of me.	1	2	3	4	5
(9) I am usually worried about what kind of impression I will make.	1	2	3	4	5
(10) If I know someone is judging me, it has little effect on me. **(R)**	1	2	3	4	5
(11) Sometimes I think I am too concerned with what other people think of me.	1	2	3	4	5
(12) I often worry I will say or do the wrong things.	1	2	3	4	5

APPENDIX F

Personal Report of Communication Apprehension (PRCA-24)

This instrument is composed of 24 statements concerning feelings about communicating with other people. Please indicate the degree to which each statement applies to you by choosing whether you:

- Strongly agree
- Agree
- Are undecided
- Disagree
- Strongly disagree

1. I dislike participating in group discussions.

   - ❑ Strongly agree
   - ❑ Agree
   - ❑ Are undecided
   - ❑ Disagree
   - ❑ Strongly disagree

2. Generally, I am comfortable while participating in group discussions.

   - ❑ Strongly agree
   - ❑ Agree
   - ❑ Are undecided
   - ❑ Disagree
   - ❑ Strongly disagree

3. I am tense and nervous while participating in group discussions.

   - ❑ Strongly agree
   - ❑ Agree
   - ❑ Are undecided
   - ❑ Disagree
   - ❑ Strongly disagree

4. I like to get involved in group discussions.

   - ❑ Strongly agree
   - ❑ Agree
   - ❑ Are undecided
   - ❑ Disagree
   - ❑ Strongly disagree

5. Engaging in group discussions with new people makes me tense and nervous.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

6. I am calm and relaxed while participating in group discussions.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

7. Generally, I am nervous when I have to participate in a meeting.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

8. Usually I am calm and relaxed while participating in meetings.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

9. I am very calm and relaxed when I am called upon to express and opinion at a meeting.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

10. I am afraid to express myself at meetings.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

11. Communicating at meetings usually makes me uncomfortable.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

12. I am very relaxed when answering questions at a meeting.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

13. While participating in conversation with a new acquaintance, I feel very nervous.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

14. I have no fear of speaking up in conversations.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

15. Ordinarily I am very tense and nervous in conversations.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

16. While conversing with a new acquaintance, I feel very relaxed.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

17. Ordinarily I am very calm and relaxed in conversations.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

18. I'm afraid to speak up in conversations.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

19. I have no fear of giving a speech

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

20. Certain parts of my body feel very tense and rigid while I am giving a speech.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

21. I feel relaxed while giving a speech.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

22. My thoughts become confused and jumbled when I am giving a speech

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

23. I face the prospect of giving a speech with confidence.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

24. While giving a speech, I get so nervous I forget facts I really know.

- ❑ Strongly agree
- ❑ Agree
- ❑ Are undecided
- ❑ Disagree
- ❑ Strongly disagree

APPENDIX G

Interview protocol

1. Reflect upon the opportunities offered by a career in academia.
2. Reflect upon the challenges offered by a career in academia.
3. What brought you to academia and why?
4. What advice would you give to students pursuing an academic career in pharmacy?
5. Comment on achieving Family-work balance in academia.
6. Comment on challenges you feel that academia poses to your family.
7. What would you have done differently on your path to a career in academia?
8. Comment on the influence your advisors had on you.
9. What do you think you missed out on in lieu of academia?
10. How can we better encourage our undergraduate/graduate students to pursue academia?
11. How do we better prepare graduate students for academia?
12. Comment on the challenges you faced as a new professor.
13. Comment on attaining a balance between research, teaching and service.
14. Comment on challenges in mentorship to undergraduates and graduate students, alike.
15. Comment on challenges in maintaining collegiality and dealing with colleagues.
16. Comment on administrative issues.
17. Comment on things you would have done differently as a new professor.
18. What advice would you give to a brand new faculty member?
19. What advice would you give to any pharmacy student, who was pondering their career choice?
20. What do you see to be most promising in your undergraduates as a whole?
21. What do you see to be the most problematic in your undergraduates as a whole?
22. What do perceive to be the biggest challenge to be faced by undergraduates out in practice?
23. What aspect of your academic career has been most rewarding?
24. What have students taught you in your years as a scholar?