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THE PHARMACEUTICAL SCIENCES AS
ACADEMIC DISCIPLINES
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Let me begin by expressing my sincere gratitude to the Rho Chi Society and to the Executive Council for the honor of being selected to present the 1988 Rho Chi Lecture. Having served as a National Officer of Rho Chi, I have been privileged to participate in the selection of the Rho Chi Lecture Awardee and am aware of the stature of the people who have been selected for this honor. I am humbled to be placed among them.

Although I might second guess the wisdom of the Executive Council in selecting me, now that I am here I fully intend to take advantage of this podium. In fact, I am very grateful for this opportunity to share with you some of my thoughts, some of my feelings and some of my concerns about pharmaceutical education. It doesn't seem like it to me, but when I look around and see the youth of my colleagues, I realize I've been at education for a long time and I suspect its only natural that I have picked up a few predilections along the way.

Objectives

In the course of this lecture I would like to share with you my view of the responsibilities of pharmaceutical education both as a unique professional study and as a component of higher education in general. My analysis of how pharmaceutical education is doing in this regard and my recommendation for raising the quality of our programs to even greater heights. I will also touch upon potential hazards to the system should pharmaceutical education fail to respond to the full spectrum of its responsibilities and the dilemma it faces in doing so. My approach will be to examine baccalaureate education in general to give us perspective on the milieu in which pharmaceutical education operates, and then to examine our professional education to give us a sense of the commonalities and the conflicts which exist between the two.

My basic thesis will be that it is essential for pharmaceutical education to strike a balance between education and training, and my major concern is that we have exceeded the balance point in the direction of training, thus compromising our success in providing our students with an education.

Definitions

I realize that the words education and training are commonly used almost interchangeably, and with good reason since they are not without a degree of overlap in their meaning. So that we don't get confused in semantics it will be useful to review the dictionary definitions. Educate is defined as: to develop by fostering to varying degrees the growth or expansion of knowledge, wisdom, desirable qualities of mind or character, physical health or general competence esp. by a course of formal study or instruction. Train is defined as: to teach or exercise (someone) in an art, profession, trade or occupation; direct in attaining a skill. Common to both is the concept of teaching and the assumption of a knowledge base which is taught. Perhaps the difference is in the outcome. Where educate carries the notion of intellectual development and wisdom, train conveys the idea of development of skill and competence in meeting some set of performance expectations.

Baccalaureate Education

Having now established as the theme for this presentation the balance and/or competition between education and training, let us look at baccalaureate education in general. Within the last several years there has been an intense focus on this

aspect of American higher education, but his interests by no means new. Over fifty years ago Dr. Robert M. Hutchins published his critical and controversial treatise on "The Higher Learning in America" calling attention to the growing conflict within universities over the shift in role from the pursuit of knowledge for its own sake to the vocational preparation of students for their life work. In citing the new schools and programs which has been added to universities in the first third of the twentieth century, including pharmacy, Hutchins acknowledged that universities bore an important part of the responsibility, but he decried the fact that the universities' primary responsibility for intellectual development was becoming obscured. In presenting his position he wrote:

"We have suggested that the curriculum should be composed principally of the permanent studies. We propose the permanent studies because these studies draw out the elements of our common human nature, because they connect man with man, because they connect us with the best that man has thought, because they are basic to any further study, and to any understanding of the world."

Hutchins permanent studies were comprised of the great books of all ages, grammar, rhetoric, logic and mathematics.

As evidence that the more things change the more they stay the same I would like to review briefly two of the more recent studies of undergraduate education. In 1985 the Association of American Colleges issued a report entitled "Integrity in the College Curriculum: A Report to the Academic Community"² which subsequently became the base for intensive study by the Academic Affairs Committee of the American Association of Colleges of Pharmacy (AACPP).³ As background to the recommendations concerning the required core of learning experiences proposed, the report expressed serious concern over the heterogeneity found in the baccalaureate curriculum, that is, the lack of coherence and integrity: the vocational orientation of students and the overdetermination of curriculum content by ends other than education in the vocational, technical and professional fields; and the transformation of professors from teachers concerned with the characters and minds of their students to professionals with an allegiance to their academic disciplines stronger than their commitment to teaching. In a manner reminiscent of Hutchins', this report contained the following nine experiences as its core:

1. Inquiry, abstract logical thinking, critical analysis
2. Literacy: writing, reading, speaking, listening
3. Understanding numerical data
4. Historical consciousness
5. Science
6. Values
7. Art
8. International and multicultural experiences, and
9. Study in depth.

The last observation from this report which I would like to cite, because I will refer to it later, is the comment that the problem with the American college curriculum is not that it has failed to offer knowledge, but rather that it offers too much knowledge and not enough attention to how that knowledge has been created and what methods and styles of inquiry led to its creation.

In 1986 the Carnegie Foundation For the Advancement of Teaching issued a report on undergraduate education entitled "College: The Undergraduate Experience in America"⁴. Among the points of tension found by this study were a mismatch between faculty expectations and the academic preparation of entering students, confusion over goals further complicated by the fragmentation of disciplines into smaller and smaller pieces such that undergraduates fail to see patterns in their courses and to relate what they learn to life, conflict between careerism and the liberal arts, divided loyalties within the faculty resulting from competing obligations, and strain between conformity and creativity in the classroom often manifested by an absence of vigorous intellectual exchange. The remedy for curricular deficiencies recommended in this report included develop-

ment of proficiency in the written and spoke word, strengthening general education through an integrated core consisting of:

- Language: The Critical Connection
- Art: The Esthetic Experience
- Heritage: The Living Past
- The Social Web
- Nature: Ecology of the Planet
- Work: The Value of Vocation, and
- Identity: The Search for Meaning.

and, in tandem with the core, an enriched major, that is, encouraging students not only to explore a field in depth, but also to put the specialized field of study into perspective.

The commonality of observations among these reports is striking, as is the philosophical agreement on actions to be taken to rectify shortcomings.

Pharmaceutical Education

Just as undergraduate education in general has been the subject of close study in the last decade, so too has pharmaceutical education undergone study. Before reviewing the more recent studies, however, a brief overview of the evolution of pharmaceutical education since its assimilation into the university setting will help establish perspective.

In his 1936 treatise Dr. Hutchins cited pharmacy as one of the career oriented programs to have become associated with the universities and, indeed, it was in the 1930's that a baccalaureate degree in pharmacy became a requirement for licensure as a pharmacist. Early curricula drew heavily upon the arts and sciences: pharmaceutical chemistry, pharmacognosy and materia medica were closely related to chemistry, bacteriology, botany and zoology; and pharmacy coursework focused on compounding and dispensing as an art to be acquired by rote learning and repetitive laboratory exercises.

The scientific explosion which was a byproduct of World War II dramatically altered the approach to the education of a pharmacist. The scientific basis for dosage forms was found in physical chemistry; putting therapeutics on a pharmacological basis spawned coursework in biochemistry, physiology and pharmacology; and synthetic approaches to drug discovery gave rise to medicinal chemistry as an offshoot of pharmaceutical chemistry. The objective of the curriculum in the 1950's was to produce the scientist on the street corner and so swept up in this movement were the educators that by 1960 it was necessary to extend the curriculum to five academic years in order to reintroduce general education and add another dimension of preparation for practice in the form of pharmacy administration.

Then came the wave of clinical sciences and practice, starting in the mid to late 1960's and fully blossoming in the 1970's. The magnetic force of this movement has been so great that all other components of the curriculum have become oriented to its field. So too has the profession of pharmacy become attracted by its magnetic force, thus reinforcing the pressures on and expectations for the curriculum in pharmacy to produce graduates who possess comprehensive, expert knowledge of drugs and drug products, and the requisite skills to advance the clinical aspects of the practice of pharmacy.

Before launching into an examination of the relatively recent studies of pharmaceutical education I want to specifically direct your attention to my intent. What I hope to do is to delineate the monstrous dilemma, and even conflict, which faces pharmaceutical education in meeting its obligation to students to prepare them for a career in pharmacy and in meeting its obligation to students to prepare them for life, itself. Part of my strategy will be to capture the thrust of the pharmacy related studies by citing the educational content and outcomes recommended with excerpts from the reports.

One of the recent studies on pharmacy and pharmaceutical education, the study commissioned by the AACP whose report was entitled "Pharmacists For The Future", provides valuable insight into pharmacy as a profession. The Study Commission advanced the concept that pharmacy should be conceived as a knowledge system which renders a health service by concerning itself with understanding drugs and their effects upon people and animals. In evaluating the performance of pharmacy as a knowledge system the Study Commission found it to be effective and efficient in developing, manufacturing, and distributing drug products but neither effective nor efficient in developing, organizing, and distributing knowledge and information about drugs.

Another interesting observation of this Commission was that a pharmacist must be defined as an individual who is engaged in one of the steps of a system called pharmacy, that is, one who practices a part of pharmacy which is determined by the activities carried on in one of the subsystems of pharmacy. The implications of this observation for pharmaceutical education were delineated by the Study Commission in its conclusion that there is a common body of knowledge, skill, attitudes and behavior all pharmacists must possess along with additional knowledge and skill required for specific practice roles, and in its recommendation that the educational objectives for pharmacy education include:

- mastery of the knowledge and the acquisition of the skills which are common to all of the roles of pharmacy practice
- mastery of the additional knowledge and the acquisition of the additional skill needed for those differentiated roles which require additional pharmacy knowledge and experience, and
- mastery of the additional knowledge and the acquisition of the additional skills needed for those differentiated roles which require additional knowledge and skill other than pharmacy. Focusing specifically on the first professional degree program the Study Commission set as minimum objectives:
 - the inculcation of the knowledge, attitudes, and habits which are common to the practice of pharmacy in all of its differentiated roles
 - the translation of that knowledge into skills common to pharmacy practice in the several roles which are not differentiated by additional knowledge and practice experience, and
 - the development of a familiarity with the nature and requirements of the practice roles which do not require additional knowledge and more complex skills to orient students to the career options open to them.

Early in this decade the American Pharmaceutical Association commissioned a Task Force on Pharmaceutical Education which conducted its study over a two year period and reported back to the profession in 1984.⁶ The Task Force report provides an extensive review and analysis of pharmaceutical education and its relationship to the profession, but I will confine our glimpse of this report to the section on the pharmacy curriculum. The Task Force suggested twelve general characteristics for the curriculum designed to prepare pharmacists at the practice entry level. In presenting these to you I have classified them in a spectrum from those relating to general education to those relating exclusively to vocational preparation. The first curricular characteristic identified by the Task Force related entirely to general education. It called for the provision of a sufficient amount of general education to prepare the student to become an informed, functioning citizen as well as a professional. Characteristics intermediate in their value, that is, offering potential for personal as well as professional growth even though set entirely in the context of professional practice applications, included instruction in the basic science knowledge base for modern pharmaceutical science and practice, development of communicative and interpersonal skills necessary for effective communication with health professionals and lay persons, development of problem solving skills important in contemporary pharmacy practice, involvement of the student in an active learning process based on inquiry and which develops a memory capacity only for its application in scientific and professional

contexts, and fostering within the student the attitude and ability to engage in a lifetime of learning and to effect and adapt to change. The remaining characteristics pertained entirely to vocational outcomes. They included providing instruction regarding selection, initiation, maintenance and termination of drug therapy for common medical conditions, creating an awareness of social, ethical, medico-legal and economic issues facing pharmacists and health care providers, fostering in students attitudes which encourage them to take active and responsible roles in the provision of health care, offering students the opportunity to pursue by means of options at least minimal preparation for the differentiated area of activity selected as an initial career choice, providing students with participatory experiences enabling them to acquire a working knowledge and the skills of contemporary practice, and offering an environment which would encourage students and graduates to take an active role in organizations having the potential to influence the policies, practices and future direction of the profession.

Another important report directed to pharmaceutical education was that of the AACP Study Committee on "Preparation of Students for the Realities of Contemporary Pharmacy Practice". The portion of the charge to this Study Committee which bore directly on curricular matters was that of developing a conceptual description of the knowledge, attitudes and skills required of students for entry and successful growth in contemporary pharmacy practice. Given the highly focused charge it received it is understandable that the Study Committee's high priority recommendations for curricular offerings were for the inclusion of instruction and guided experiences in fiscal and personnel management, and for including practice related courses early in the curriculum so that pharmacists' input in the classroom and student visits to practice sites could be fostered. The Study Committee recognized the important role the basic sciences should play in developing the scientific knowledge base upon which clinical practice depends and in developing skills in the systematic approach to problem solving, thus it made a high priority recommendation that there be an emphasis throughout the curriculum on the preparation of graduates who can use problem solving skills to make decisions which promote safe, effective and economical use of drugs in patient care. Recognition of the importance of the development of communications skills was evidenced by the high priority recommendation that core and elective courses throughout the curriculum include instruction, guided experience, and formal evaluation and feedback to students regarding their written and oral communications.

Reality of Where We Are

Having now looked at studies directed toward identifying the shortcomings of baccalaureate education from the perspective of higher education as an enterprise and at studies of the weaknesses in the entry level preparation of pharmacy students as a responsibility of schools of pharmacy to the profession of pharmacy, the dilemma facing the pharmaceutical education enterprise is clear. Entry level degree programs, whether baccalaureate or professional doctorate, cannot abandon the obligation to provide graduates with educational outcomes expected for anyone receiving a university degree. But as preparation for professional recognition and practice, these programs must produce graduates who meet society's expectation for competence to enter a profession. Hutchins' comment made more than fifty years ago strikes to the heart of the matter:

"The subject matter of a learned profession is intellectual. Though the rules of the trade may be learned in the practice and indeed can generally be mastered only in a university, at least a university should be the ideal place for such study. To the extent to which the attention of the student is directed vocational interests and away from the intellectual content of the discipline the university fails to do the only thing it might do and attempts something in which it is bound to fail."⁷

To fully understand the thrust of Hutchins' comment it is necessary to know the context, he is commenting on baccalaureate education and his prediction of failure was made in the sense of vocational interests interfering with achievement of optimal intellectual growth.

For the present, the common model for entry level academic programs in pharmacy remains either as the five academic year baccalaureate program or a six year first degree doctor of pharmacy program. Tempting as it may be for me to digress and give my views on the appropriate model for our educational program, I will resist and stay on track. But given the constraints in our present approach to preparation of students for careers in pharmacy, I am distressed to see the ever increasing expectations for the development of vocational attributes, however laudable and desirable, placed on our academic programs. The reports of the studies we have reviewed are permeated in their language and dominated in their recommendations with an emphasis on inculcating knowledge and developing skills, in short, the training of students for professional practice as we know it today. What recognition is given to the importance of communication and the development of problem solving ability is cast in the context of professional utility.

For myself, I cannot but conclude that pharmaceutical education as a pursuit of intellectual growth is seriously deficient, and as preparation for life outside of the work environment is terribly flawed. General education, mandated at twenty percent of our baccalaureate curricula by accreditation standards, is completed almost exclusively in the pre-pharmacy years and not at all designed to achieve the objectives of liberal studies. As a matter of fact, even as important as our accreditation standards are in protecting general education, both in their language which conveys the dominance of professional coursework and their implementation which stresses the outcomes in terms of practice skills, they send a signal to educators and students alike that the objective of training predominates and education is a secondary outcome.

We must honestly face the question of whether we have reached the point of overtraining and undereducating students in the entry degree program. The answer is exceedingly important because if, indeed, we have overcommitted our program to the preparation of students for practice at the expense of their intellectual growth, we flirt with a terrible danger for our graduates. An overconcentration on preparing students for practice will result in a narrowing of the scope of the program of study to content relevant to contemporary knowledge and skills. Thus, the ability of our graduates to anticipate and to adapt to change will be limited to those changes we can foresee based on current knowledge, or at best, enlightened speculation.

In this regard I agree with the 1986 Argus Commission of the AACP which observed that the pharmacists who succeed in an environment of new technologies and changing practice patterns will be those who have a good theoretical base in the basic sciences and in the humanities, can analyze trends and events and recognize their implications to professional practice and to the individual, can develop personal strategies to succeed in the face of this change, and can acquire additional knowledge and skills that may be required.¹

Responding To The Challenge

There is no blueprint for success or easy remedy for the dilemma we face. As with all problems in which conflicting views must be brought into harmony it is easier to achieve agreement in principle than agreement in action. In principle, the solution is to find the right balance between our competing educational responsibilities. To reach agreement in action, we have to establish just where the right balance is to be found.

I believe the 1985-86 AACP Academic Affairs Committee was on the right track with its white paper on "Components of a Minimum College Curriculum: Relationship to Pharmacy Education". Using the nine experiences identified as

core in the report "Integrity in the College Curriculum: A Report to the Academic Community" cited above² as guideposts, the Committee made a thoughtful analysis of the pharmacy program and developed a series of recommendations for strategies to achieve the core experiences through the pharmacy curriculum. Unfortunately, the white paper has not received much attention. Further insight has been provided by Brodie³ who observed that technology may well become the driving force for increasing the amount of general education because "... living in the age of science and technology will be increasingly depersonalized; at times it will be lonely, harsh and cold; often it will stress our emotions and spiritual nature." So too has Salamon, one of the members of the Association of American Colleges Select Committee which issued the report, offered direction in telling us how the professional curriculum in pharmacy can serve as education in depth; if it is not excessively structured and overprescriptive of training in currently fashionable technique, ephemeral education and obsolescent technology.¹⁰

It seems to me that the signs are clear. The obvious place for pharmaceutical education to address the issue of achieving the dual goals of preparing students who can relate to the world around us and of providing the base for professional competence is in the pharmaceutical sciences. Having reached the point of academic maturity, that is, scientific disciplines which qualify their own right as fields for research and scholarly pursuits, our sciences can and should be taught for their intrinsic value.

For evidence for their academic maturity we need only to trace the development of the pharmaceutical sciences over the last forty years. At the time of our point of reference pharmaceutical sciences was non-existent because dosage form development was looked upon as an art, medicinal chemistry research consisted largely of the synthesis of a homologous series of compounds in an empirical search for structure-activity relationships, pharmaceutical chemists and pharmacognosists were engaged in the isolation and purification of active principles from natural sources through extraction and crystallization, and pharmacology was just beginning to replace *materia medica*, the rote learning of the medicinal application of drug substances, as one of our sciences. Pharmacy administration was not identified as a discipline until the 1950s and when it was introduced its focus was on managing the operation of a drug store. Today our sciences have merged with other basic disciplines just as oil droplets run together on a water surface. Biochemistry, molecular biology, genetics, immunology, microbiology, peptide chemistry, enzymology, toxicology, organic chemistry, analytical chemistry, physical chemistry, anatomy, chemical engineering, computer science — these and more are fundamental to our bench sciences. Pharmacy administration has matured to depend upon principles from economics, sociology, psychology, marketing, accounting, consumer sciences and other disciplines within the social sciences and humanities.

Thus, if we reduce the constraints on our sciences resulting from a demand for relevance to pharmacy practice in justifying their inclusion in the curriculum, and value them as well for their ability to demonstrate how knowledge is created and the coherence which exists between scientific disciplines, they can serve to meet the need for study in depth as an intellectual exercise and serve as the base for developing problem solving skills applicable to professional practice. What we must back away from is the vocationally driven temptation to offer too much knowledge.

While the case for treating the pharmaceutical sciences as academic disciplines has been made on a philosophical and idealistic basis, there are practical advantages as well. If content is selected not only for importance to pharmacy but also to illustrate relationships within the scientific world, to demonstrate creative thinking and problem solving and to offer students the challenge of personal intellectual growth, our courses will have value over and above that of preparing students for practice as a pharmacist. For pharmacy students new vistas may be

opened, vistas which will lead them to new practice roles or to career pathways they had not previously considered. Such coursework would also serve students in the university other than pharmacy students and students with career interests other than the licensed practice of pharmacy, that is, the pharmaceutical sciences will be made available to a large segment of society. In fact, the ultimate outcome which I see as the result of expanding the availability of the pharmaceutical sciences to other students is the establishment of a recognized academic baccalaureate major in pharmaceutical sciences analogous to majors in chemistry, biology, etc. I further see this baccalaureate program serving as the required base for professional education. In this regard it is interesting to note that the professions generally accepted as learned, medicine, law, and theology, have adopted a post-baccalaureate model for their professional education programs.

Additionally, pharmacy as a profession will be well served by strengthening the pharmaceutical sciences as basic instructional disciplines. Although true now, it would become even more obligatory for every faculty to offer rigorous basic science instruction, whether the school is research intensive or not, thus preserving the capability of the pharmaceutical sciences to keep the profession abreast of advanced in, for example, drug design, drug delivery and therapeutics as well as public policy on health matters, cost containment strategies and consumer in a constantly changing health care environment.

Conclusion

In coming to closure on the challenge of meeting the twin objectives of educating to maximize personal intellectual growth and education to assure competence in pharmacy, it is fair to observe that although the pharmaceutical education enterprise has put to rest the matter of the baccalaureate versus the doctoral degree, it obviously has not settled the basic issues which drive the controversy. The issues of dealing with the ever increasing knowledge base, of recognizing the importance of preparing personnel for all facets of pharmacy and of balancing intellectual pursuit with professional preparation are not new¹¹ and they will not go away by themselves. They continue to demand our attention and they must be dealt with in a resolute manner rather than by inaction and default.

In closing, let me leave you with two thoughts with which you can agree or disagree but which I hope you think about.

First: To the extent that there is dissatisfaction in pharmacy practice among recent graduates, it may well be a symptom that we are overtraining and undereducating. Through training we develop a high degree of skill in the performance of tasks associated with a given role. When that skill is not useful or not transferable, frustration results. Education fosters the development of the ability to organize variables, select from among them and develop a course of action, and to think independently in generating ideas. It is these attributes which form the base for adaptation to change.

Second: The traits of character which are most valued in the marketplace such as initiative, logical thinking, motivation, dependability, leadership, insight and honesty, all need to be learned, yet none of them can be taught. The best chance we have that they will be learned is to expose the learner to examples of how others have developed them and demonstrated them. Achieving this goal is the biggest challenge of all facing the pharmaceutical education enterprise, and it is there whether we confront it under the rubric of intellectual growth or professional education.

Thank you again for inviting me and for your very kind attention to my thoughts.

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