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SPECIAL ARTICLES

Pharmacy Schools as Expert Communities of Practice? A Proposal to Radically Restructure Pharmacy Education to Optimize Learning

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It is proposed that if pharmacy education is reconceptualized within a "communities of practice" framework, a collaborative educational strategy is revealed that can help the profession and its educational institutions deal successfully with many social and professional issues that have led to a foundering sense of shared identity and meaning. In particular, communities of practice will lead to increasing student and pharmacist expertise, expand and enrich the scientific basis for the paradigm of pharmaceutical care, and rationalize the division of labor and faculty workload in the professional program, significantly increasing faculty satisfaction and retention.

Keywords: pharmacy education, community of practice, health professions education, pharmacy, curriculum

INTRODUCTION

I believe that education, therefore, is a process of living and not a preparation for future living.

—John Dewey[1]

After several decades of tumultuous change within the profession and its institutions, many are struggling with issues of identity, meaning, information overload, attaining and expanding expertise, workload, division of labor, professionalism, and accountability. While we seek unity under the ideology of pharmaceutical care, we are bedeviled by the diverging needs and aims of academic, community, and institutional practice. While we squeeze yet another drug or disease into the curriculum in our attempt to keep up with the explosion of new pharmacotherapy knowledge, we are being asked to take time to teach critical thinking and self-learning skills and assess outcomes in the service of a new educational paradigm centered on learning.[2]

In this manuscript, we argue that fundamentally restructuring the pharmacy education system may enable schools to adapt to these pressures effectively and efficiently, while retaining and even enhancing a sense of professional and academic integrity. Specifically, a reconceptualization of the system of pharmacy education as a "Network of Communities of Practice" (NCoP)[3] would be particularly profitable in that such networks are more likely to: (1) develop and sustain pharmacist expertise; (2) lead to closer relationships among academia and institutional and community practice; (3) facilitate the more widespread adoption of pharmaceutical care in practice; (4) ensure that students achieve educational outcomes; and (5) rationalize the division of labor and faculty workload in the pharmacy program, significantly increasing faculty satisfaction and retention.

Communities of Practice (CoPs) are groups of people with common interests and goals that form to share what they know, to learn from one another in order to develop and extend expertise, and to share a social context for their work. Their value has been quickly recognized by many modern knowledge-based companies facing pressures for accountability and quality and the need to adapt to new and rapidly shifting technologies and customer demands.[4] In fact, although some successful CoP initiatives have been reported in the educational literature, much of the CoP research has occurred in the field of management, and their utility and profitability has been well-documented for companies such as Siemans,[5] IBM Global Services,[6] the Canadian Pulp and Paper Industry, and Caterpillar,[7] to name a few.

This paper presents an educational model based on networks of CoPs and will take the following course:

- In exploring the nature of communities of practice, it will be demonstrated that they are among the most authentic learning environments. In CoPs, deep, extensive, and meaningful learning occurs naturally because of the need for participants to function competently as members of the community.

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- By developing understanding of how CoPs act as a fundamental source of social identity, their potential to professionalize students as members of the profession at its deepest, moral basis will be revealed.
- By enumerating the ways in which CoPs authentically develop social value,[8] such as networks and shared values, their ability to increase the efficiency and effectiveness of an educational institution will become apparent.
- Through an analysis of the ways in which CoPs develop intellectual value[9] and expertise it will be shown that CoPs can continually enhance graduate satisfaction, and the excellence of pharmaceutical care, all of which ultimately lead to greater investment and growth.

Based on an understanding of CoPs, the educational potential of networks of CoPs (NCoP) will be contrasted with the currently predominant large class, disciplinary models of pharmacy education whose curricula generally begin with the explanatory sciences and end with practica (Figure 1).

If an NCoP model is adopted in pharmacy schools, it has implications for:

- The educational mission of pharmacy schools. In our current educational model, our "educational client" is the student and our "consumer" is the practice site who hires her. In the NCoP model, our educational clients would be practitioners, ranging in expertise from the novice ("student") to the continually developing expert. Our consumers in the NCoP model would be patients and society.
- Departmental structure. An NCoP model of education would require tighter integration of the fundamental sciences and practice, perhaps requiring departments to be structured around outcomes rather than disciplines;
- The educational process. In an NCoP model, admissions, curricula, and assessment would require reconsideration;
- Scholarship.[10] Currently schools of pharmacy reward the scholarship of discovery and application and are beginning to reward the scholarship of teaching. In an NCoP model, the scholarship of integration will assume greater prominence.

Each of these implications will be discussed in the conclusion of this manuscript. A second paper will describe specifically how the NCoP idea might be implemented in pharmacy.

WHAT IS A COMMUNITY OF PRACTICE?

Although the term *community of practice* is new, communities of practice, per se, are not. CoPs were the first knowledge-based social structures[11] and arose when people realized they could benefit from sharing their knowledge, insights, and experiences with others with similar interests or goals. They exist in families, dispensaries, health practices, and professional organizations such as the American Association of Higher Education (whose web site offers information on membership in several CoPs[12]). The American Association of Colleges of Pharmacy is really a network of CoPs, and exemplifies a structure that Pharmacy Education might emulate. Examples of successful CoPs in the educational arena[13] include e-learning communities,[14,15] continuing education learning groups in medicine,[16] "cooperative education" (ie,CoOps)[17] and apprenticeships.[18] Barab and Duffy described several successful NCoPs.[19] The INSITE program is a collaboration between 2 universities, 8 school districts, local industry, and the Indianapolis Children's Museum in which students, supported by the expertise of University faculty members and input from other schools, address issues of concern. In the I*EARN project, a K-12 community works on environmental and community projects supported by experts around the world. In the community of teachers (CoT) program, pre-service teachers negotiate mentorship and membership in a group of learners. Participation in the group involves teaching, being mentored by an expert, and revolving leadership in teaching seminars. The students' goal is not to achieve grades, but to demonstrate to the experts' satisfaction that they possess 30 qualities of good teachers. The group is longstanding. New pre-service teachers enter and more experienced "old hands" leave.

CoPs are distinguished from other social groups (Table 1) by 5 common characteristics: (1) a mission; (2) a practice; (3) a communal, practice-centered identity; (4) explicit and implicit roles, procedures and rules, and most importantly; (5) shared knowledge and learning.[20]

A Mission

Members of a CoP share a mission, or a set of goals or objectives.[21] Working together, CoP members are doing something that is important to each of them, be it processing prescriptions, solving drug-related problems, or advancing disciplinary knowledge. The mission of a community of practice, however, is unlike many institutional missions in that it is focused; directed to the everyday work and beliefs of its constituents.

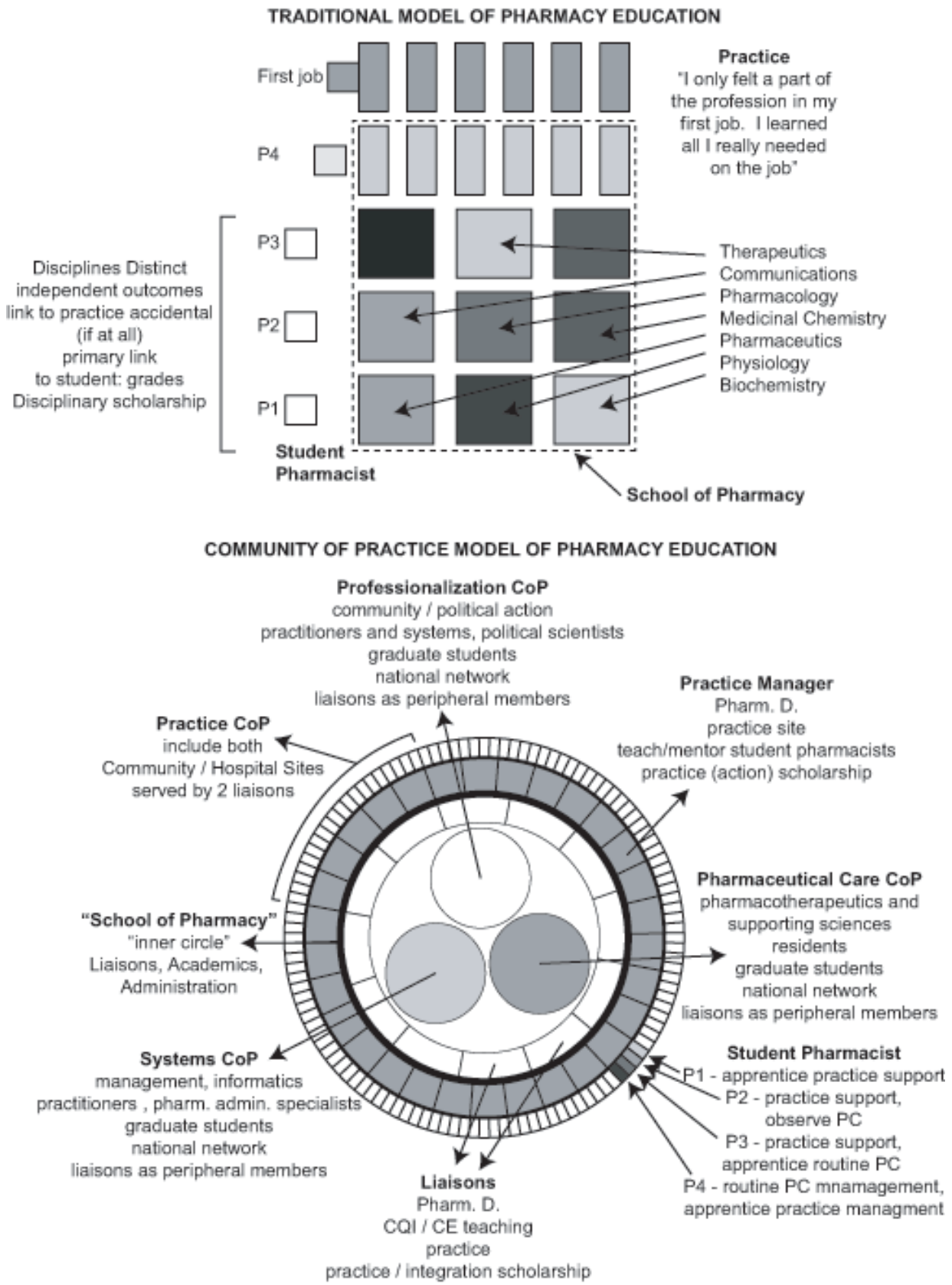

Figure 1. A comparison of the structure of traditional schools of pharmacy with the structure of schools in a proposed community of practice (CoP) system. The traditional school is organized linearly around disciplines. The CoP school is organized around communities who share common curricular goals.

Table 1. A Comparison of Different Social Groups

Group Types	Function	Basis of Membership	Basis of Cohesion	Duration
Communities of Practice	Develop members' expertise, define their place or role in the community, develop the expertise of the community as a whole, serve some value	Self-organizing group of knowers	Commitment to and identification with the expertise and the social history that forms the basis of the practice	As long as members have an interest in improving practices and maintaining community
Formal Work Teams	Produce and deliver a product or service	Everyone who has been assigned to the team according to the skills and knowledge they bring	Performance standards and common medium to long-term goals	Until the work or the organization changes
Project Teams and Task Forces	Accomplish a specific time-limited task or assignment	As assigned by management	Project milestones and goals	Until the project or task has been completed
Department	Manage workload	By discipline	Varies – often little basis, can be social or information sharing	Until the organization changes
Informal Networks	Collect and share information of common interest	Reciprocal value and acceptance (of both knowledge and people)	Perceived value in belonging and participating	As long as people have a desire to connect and share information

A Practice

Members of a CoP have in common their practice: a set of common responsibilities and tasks that define their common work and achieve their common goals. Through their work, CoP members operationalize the ideal processes and theoretical strategies they may have been taught in a didactic environment.

A Communal, Practice-Centered Identity

The development of a practice-centered identity (ie, I am a pharmacist or pharmacotherapy expert) is one of the critical features of a CoP that distinguishes it from other situated learning environments such as problem-based learning (Table 2).[18,22,23]

One cannot develop a practice-centered identity simply by learning about the practice. While it is true that most of our knowledge is about things, eg, football, politics, and so on, this superficial learning keeps us at the periphery of a discipline. As long as one remains peripheral, the practice will play little or no role in one's identity. This is the situation in many pharmacy "fundamentals" classes, for example biochemistry, where students learn about the topic but never ask or answer its fundamental questions or become involved in its scholarship. A practice-centered identity arises when students appropriate the ways in which the members of the practice (or profession) think, feel, and behave; that is, they learn to be.[24]

This socialization can become professionalization if the way of being modeled by the practice aligns with the profession's idea of what constitutes professionalism. This assertion is supported by the findings of Burkitt et al.[25] In their study, teams of qualified nurses joined various communities of nursing practice as participating members, shadowing designated nurses and reviewing daily practice in critical incident interviews. They found that the members of these communities of practice developed a strong, mutually held identity centered on the idea of "the good nurse."

Full membership in a CoP is equivalent to competence and a personal identity entwined with that competence. However, not every participant in a CoP is a full member. Those who are more peripheral to the practice may be learners (apprentices) and/or emissaries from other practices. Practice cannot exist without its peripheral members. In a CoP, students play a role that is critical in the CoP's functioning and persistence. Moreover, students become more central to the practice as they gradually get entrusted with more complex tasks. This must be contrasted with the current state of affairs in which students are often considered to be burdens to the practice – consuming resources, but not contributing substantively to its aims. Furthermore, they enter and leave the practice with the same status – that of students, not practitioners.

Table 2. A Comparison of Psychological and Sociological Variants of Situated Learning[45]

	Psychological	Social
Example	Problem Based Learning, Cognitive Apprenticeship	Community of Practice
Focus	Individual cognition	Communal cognition leading to real-world outcomes
Learners	Students	All members of the CoP
Unit of analysis	Situated activities –authentic learning tasks in which students learn to solve problems that are as realistic as possible	An individual practicing in a community
What is produced	Understanding, grades, identity of a student	Meaning, identity as a productive practitioner, communities
Learning arena	School	Practice (in an NCoP, *through* schools)
Goal of learning	Practice: Prepare for future tasks	Contribution: Meet societal needs
Pedagogical implications	Learning is active and reflective; Collaborative problem-solving; Problems ill-structured and complex; collaborative – negotiated meaning; Ownership of the solution (not simply finding out what the teacher wants); Teacher facilitative (does not solve problems personally, but selects them and develops students' skills in solving them); Teacher motivating: a fictitious situation is harder for the student to take "seriously";	Learning is reflective and directed towards expertise and development(professionalization); Collaborative problem-solving; Long term membership in a group with a history, shared goals, negotiated meanings, practices, interdependence; The student assumes a role that is essential to the practice; Community is self sustaining; Teacher assumes role of collaborator (models the solution of more difficult problems; coaches intermediate ones; allows independent problem-solving where competence has been demonstrated); Teacher assumes role of mentor;
Assessment	Only the performance of the student is assessed; Results in grades. Authentic portfolio assessments that diagnose and track performance, and demonstrate competency and excellence may diminish grade focus.	The performance of all members of the CoP is assessed; Results in responsibility and esteem. Incremental "practice" portfolio – the learner assumes responsibility (and is accountable) for practice in demonstrated areas of competence.
Identity	Student	Practitioner

Ways of Working Together - Explicit and Implicit Roles, Procedures, Rules

Members of a CoP are interdependent and mutually accountable through implicit (eg, everyone can count on Mary to come in a bit early and get things started) and explicit (eg, a policies and procedures manual) roles, rules, and procedures. In learning to work together, more peripheral participants learn to *become* more central members of the group. Although practices with shared goals often have much in common, the roles, rules, and procedures tend to be unique to their context.

Shared Knowledge and Learning

Knowledge is both explicit (concepts, principles, procedures) and implicit (knowledge that we cannot articulate). Taken together these implicit and explicit forms of knowledge constitute competence with respect to the CoP's work, for example, pharmacy knowledge is competence with respect to providing pharmaceutical care. Similar to classroom learning, members of a CoP often learn by sharing explicit knowledge. But they benefit most from each other's dynamic, implicit knowledge, because only in close proximity (and with shared work) can individuals share what they know implicitly by "just-in-time" storytelling, conversation, demonstration, and coaching.

As members of the CoP work and learn together, mutual understanding is negotiated through the complementary processes of participation and *reification*. Individuals participate in CoP simply by working towards shared goals. *Reification* is the process whereby we make explicit that which was previously implicit. It generates increasing focus and clarity by taking amorphous experiences and turning them into concepts, tools,

rules, procedures, databases, missions, plans, contracts, and stories. Thus, a CoP is inherently *metacognitive*.[26]

Participation and reification are complementary. Participation gives CoP members a common context for understanding, and reification is the way in which a common understanding of that meaning in negotiated. As complements, these processes make up for each other's shortcomings. A reified documentation method such as a SOAP note is more likely to be adopted by an organization through extensive participation in the discussion of its merits and shortcomings. Conversely, the results of a long and complex discussion are more likely to produce concerted actions when they are reified in minutes.

Participation and reification must *both* be present. When reification dominates, there may not be enough mutual understanding of the artifacts to yield a concerted effort towards the enterprise. This is a common problem in the classroom where students, participating as pupils, primarily learn "how to go to school." In this kind of classroom, where full participation is only accessible to teachers, students learn to memorize a host of reified facts and promptly forget them because they have no meaning outside their role as students.

When participation dominates, as it often does in pharmacy practices, there may be nothing to anchor and direct activities. This is a common problem in pharmacies where work becomes "routine." With little or no documentation of processes or outcomes, without a focus on deepening understanding of practice problems, there is nothing that is mutually understood enough to be improved.

While working in a CoP, learning comes naturally. In fact, apprenticeship in CoP[18] is probably the most epistemologically appropriate way to learn. It is in this kind of environment that we humans demonstrate the (surprising?!) fact that we are all quite proficient learners. That we often come to the opposite conclusion about learners in pharmacy schools is more likely an indictment of our educational system rather than the individual learners' abilities.

Networks of Communities of Practice

A network of CoP is an educational system that intentionally balances participation and reification while disseminating best practices and explicit knowledge among CoPs. Many knowledge organizations are structuring themselves as NCoPs. In a network, communities interact through intermediaries or "brokers" who share knowledge among the practices to create a responsive organization. In such a network, some practices may have similar functions but different contexts, while other practices may have different or coordinating functions. Within the American Association of Colleges of Pharmacy (AACP), each section and some of the special interest groups can be identified as CoPs. The network is formed by the coordinating functions of the staff and elected officials who facilitate communication and the diffusion of knowledge and ideals among the group.

COP, IDENTITY, AND PROFESSIONALIZATION

A "crisis of professionalism" has been identified in all professions and has been of concern for at least 50 years.[27] One reason for the perceived decline in professionalism may be that education fails to enable students to develop an identity that is centered in their profession. By teaching ideals and not behaviors,[28] by pursuing grades rather than the wellness of patients, students find it difficult to translate what they have learned into a "way of being." Students often leave school with an unclear professional identity, lack of esteem for the profession, and a minimal sense of belonging.

Graduation and licensure often do not solve the problem. Entering practice will certainly develop a graduate's identity as a practitioner, but it may not be an identity favored by the profession. While pharmaceutical care has been adopted as the mission of pharmacy by professional organizations, accrediting bodies, and educational institutions, it has not made strong inroads into the practice of pharmacy in many contexts.

Often, graduates who have recently been inculcated into the tenets of pharmaceutical care find themselves assessed on the basis of their ability to realize profits for their employers. The fact that what the faculty at their college of pharmacy had promulgated is different from what appears to be valued in practice causes a decrement in graduates' esteem for their education and the philosophy it espoused.

The problem of identity formation in pharmacy school is exacerbated by the fact that, in many cases, generalist practitioners play a small role in the first 3 years of the educational process. The faculty rosters of pharmacy schools tend to be populated with pharmacotherapy specialists who have little in common with the generalist and disciplinary scientists who have no background (and little interest) in pharmacy as a profession.

Shulman included the presence of a CoP among the 6 identifiers of a profession (the others being service, theory, skilled practice, judgment in uncertain situations, and learning from experience).[29] Participation in networks of CoPs throughout the 4 years of pharmacy education would forge a natural link between the reified

moral codes and conceptual knowledge and practice by simply allowing students to make judgments everyday (and live with the results). In support of this assertion, CoPs have been shown to develop a learner's ability to embody professional ethics in the practice of law.[30]

COP DEVELOP SOCIAL VALUE

In its 2001 Report, The Institute of Medicine listed collaboration as one of the priorities for change (and education): "Clinicians and institutions should actively collaborate and communicate to ensure an appropriate exchange of information and coordination of care."[31] Effective collaboration and communication are facilitated by the networks, relationships, and linkages to knowledge sources that CoP members construct. In the management literature, these connections are considered as "social capital" or "social value" that enables an organization to increase its rate of adaptation, innovation, and learning. The result is increased responsiveness and faster project delivery, with a reduced need for rework and reinvention.[32]

In addition, the CoP:

- Provides resolution to institutionally generated conflicts, such as contradictions between what is considered to be work and what is evaluated;
- Connects personal development and identities of individuals to the strategy of the organization;
- Helps a functional group endure the loss of old timers and experts and helps integrate novices;
- Makes work "livable."

Regrettably, it is in the overt (ie, reified) development of social skills and emotional intelligence that most CoP perform least optimally, because often the social value remains at the implicit level. NCoP could conceivably direct some of their efforts towards reifying social values, the result being a very profound, positive influence on the effectiveness of practice environments. Of course, academia is expert at reification – and so it is in the social sphere where academic scholarship has the potential to benefit pharmacy practice profoundly.

COP DEVELOP INTELLECTUAL VALUE[33] AND EXPERTISE

Expertise is the *raison d'être* of a profession. According to pharmacy's mission, our expertise should enable us to identify, solve, and prevent drug-related problems and manage the systems (financial, information, and human) that support it. Expertise is characterized by 3 attributes[34]:

- Deep and Extensive. Long-term, highly interrelated formal, tacit, and self-regulatory knowledge. A study of many different areas of expertise suggests that it takes *practice* to develop this highly connect knowledge – about 10,000 hours of working, day in, day out, with the problems of practice.[35] CoPs are valued in the business world specifically because they enhance the acquisition and retention of expert knowledge.[4] Moreover, the expertise is distributed among the members of the practice in a "communal memory" which tends to diminish the deleterious effects of inevitable turnover on the quality of the community's practice.
- Skillful Problem-Solving. Experts are able to capitalize on their extensive knowledge by immediately recognizing patterns that permit them to solve most problems rapidly and accurately. Furthermore they use a strong scientific process to solve new problems. When directed towards expertise, CoPs enhance individual members' problem-solving and strategic-thinking skills. Perhaps more importantly, they facilitate the development of collaborative processes such as organizational learning, quality management, and participative leadership that render the problem-solving ability of the practice greater than the sum of the ability of each member.[36]
- Raising the Stakes. As knowledge is integrated, experts reinvest their mental resources in more learning, which maintains and enhances their expertise. A well-functioning CoP is a proven context for generating new knowledge because the strong bond of communal competence supports risk but also makes foolishness less likely.

The work of Bereiter and Scardamalia[34] suggests that membership in a CoP makes the development of expertise more likely. There are 3 reasons that people choose a path that leads them towards expertise. The first is that under the right conditions (when the problem is challenging, but not beyond the problem-solvers' capabilities)[37] it simply "feels good." The second is a heroic aspect of personality: there are some people who will develop expertise despite barriers that for others would have hindered growth. The third reason is that they are working and learning in a CoP-like environment in which the development of expertise is natural and expected. Such an expert CoP has a decidedly academic flavor because it is an environment that fosters the development of so-called *true knowledge* – that in which discourse transforms personal ideas into objective knowledge that is accepted by the community.[38]

A Contrast - The Current Educational Paradigm in Pharmacy

There was a time when professional pharmacy education was undertaken *only* in CoPs, via apprenticeships. However, over the last 2 centuries, the responsibility for professional education has been shifted to universities. This move overcame the problem of excessive variation in quality among practice sites, and therefore in education. While the move to universities also enabled more uniform and "efficient" teaching of the (reified) sciences, it created an ever-widening gap between reification and practice. Thus, today it is a common experience for us to hear students say that they learned everything they really needed on the job. This is lamentable since the formal (ie, reified) knowledge taught in schools has the potential to greatly enhance practice.

A similar split has occurred within individual colleges and schools of pharmacy. Teachers are members of CoPs (for example, special interest groups in various pharmacy organizations), but rarely are their CoPs associated with their university teaching responsibilities.

Given the pressures for accountability and quality that existed even a century ago, perhaps the institutional format was the only viable option when books were expensive and people and information could move only at the speed of a steam locomotive. But today, in the information age, technology may enable us to reconsider the CoP model.

Some educational innovations come close to realizing the benefits of CoP and NCoP but lack some critical components. Problem-based learning provides collaborative problem solving, but does not build a practice-centered identity. Advanced pharmacy practice experiences expose students to practice, but these practices tend to be isolated from the reifications learned in school. And students are only *visitors* to these practices – they stay about a month, consume preceptors' energies, and then move on. Early practice experiences, such as the Professional Practice Experience (PPE) program at the Auburn University Harrison School of Pharmacy,[39] enable students to become members of historied learning communities. However, the PPE practice is not authentic. In PPE, a team of students is assigned to a group of patients, which they visit on a weekly basis. While they provide companionship and care for the patients, only a small fraction of the practice involves pharmaceutical care. In addition, not all the mentors are committed to pharmaceutical care and professionalization.

PROFESSIONAL EDUCATION AS EXPERT COMMUNITIES OF PRACTICE

Consider that the following problems that pharmacy educators are currently attempting to address are solved by CoPs (see above):

- The need for enhanced professionalization and professionalism;
- The need for better teamwork and communication skills;
- The need to instill a habit – and a passion for – lifelong learning to maintain and enhance expertise.

Furthermore, an expert CoP model of pharmacy education could authentically integrate science into practice by creating an administrative structure in which both students *and* practitioners would be required to ask important questions and find profound answers for them. Finding/Identifying important questions is not hard – ask a drug information center about the questions they have answered in the last year, or ask a practitioner the questions he asks of himself in the process of learning enough to solve problems related to a new agent on the market. For the answers to be profound, the members of an NCoP would be required to ask why until explanations were found in the deep principles of the underlying sciences. In the process of answering questions like these, students do not learn about medicinal chemistry, biochemistry, or any other discipline. What they learn is profoundly scientific pharmacy practice.

An expert NCoP model would reinterpret a school as being a community of inquirers[19] in which students begin to participate as peripheral members, but become more central as they progress. In pharmacy, the mutually shared, ideal goal might be the eradication of drug-related problems, maximizing long-term benefit from drug therapy, and minimizing the long-term social cost of drug therapy. In an NCoP model, students *and* teachers would be solving real problems that challenged their knowledge and skills, requiring them to constantly expand their expertise. Significant contributions, adherence to the ideals of science, and professional growth would be recognized and rewarded.

Expert NCoP would deal explicitly with the need to balance reification and participation. In the process of curriculum development, questions such as the following would be addressed:

- What formal, disciplinary knowledge must be integrated into practice? What are the profound and important questions we need to ask? How can we disseminate these questions and the knowledge they generate into community-based practices so that they become part of the repertoire of the profession?
- What procedures and documents need to be formalized? How can we organize communal discussion and participation to come to consensus on their meaning and use?

- What problems can we give to students to solve so that they are kept at the edge of their competence? How can we select from the domain of possible topics so that their competence is developed as efficiently and effectively as possible?
- As experts (ie, faculty members and practitioners) solve problems at the edge of their expertise, how can the insights and skills gained be disseminated among all community participants?

NCoPs capitalize on technological innovations.[40] Listservs are an excellent forum for sharing expertise and problems, and student-generated databases can be used as authentic knowledge sources by other students if they are appropriately validated (as is true in an authentically scientific process).

Expert NCoP will benefit the profession. As people work with each other in the process of exploring and applying the idea of pharmaceutical care, a mutual understanding of its potential and limitations will emerge, and if well documented, can improve our understanding of practice in addition to improving the professional curriculum and its intended outcomes.[41]

An NCoP model would be beneficial to the university as well. Faculty members would continue to develop their expertise in a dynamic environment, and according to Cappelli, "Employees belonging to world-class communities of practice exploring cutting-edge issues are more likely to stick around."[42]

Structural changes are needed if CoP are to be realized in pharmacy schools. Daily operations and physical space would have to permit a tight integration of engagement, goals, and tasks. Barriers to trust would have to be addressed explicitly and the personal needs of faculty members and students would have to be accommodated.

The need for profound discourse in the development of knowledge and for the solution of interpersonal problems would make regular interpersonal encounters a necessity. The amplification of reification, for example, when new policies or tools are introduced into an NCoP, usually requires a concomitant amplification of participation and discussion to develop consensus and consistent practices. Discourse would be taken seriously and students' participation would be shaped by the teacher in growth-supporting ways.

The boundaries between academia and practice would become less distinct. Faculty members would need regular opportunities to participate in practice, and practitioners would need regular access to educational resources. Practitioners would need to learn how to mentor, teach, facilitate, and assess learning, and academics would need accountability for a practice's success, both in terms of financial viability and the provision of pharmaceutical care for patients.

There would be a need for "brokers"[43]—individuals whose role is to move among practices and academia while disseminating reifications (such as standards, methodologies, and curriculum) and best practices by translating, coordinating, and aligning perspectives. While the brokers could be faculty members or practitioners, they could also be students or new graduates. In the latter case, maintaining contact with them to continue to facilitate their development would be critical.[44]

Departments might need to be reorganized. It might make sense to develop departments around types of practice problems or types of practice responsibilities rather than around the practice versus science paradigm. For example, in one department, practitioners and scientists would be working together to teach students how to provide pharmaceutical care to individual patients, while in another department, practitioners and scientists would be working together to teach students how to provide deep explanations of pharmacotherapy while contributing to new knowledge.

Curricula might need to be turned upside down. Think about how people develop expertise in practice. They do not learn the theory first. They learn the practice and then learn theory bit by bit to improve their practice. An excellent example of this authentic process can be seen in the movie *October Sky*. It might be more reasonable for students to learn how to solve drug-related problems first, and only later, learn to explain their decisions and enhance their expertise based on powerful, scientific concepts and principles.

Faculty members would need to be of a special character. In addition to caring about the knowledge they help students to construct, they would also be assessed on their ability to model expertise and professionalism.

Admissions and continuing education (CE) policies might need to be altered. Practices would conceivably have a much greater role in the selection of new student pharmacists. And participation in a true CoP might make participation in mandatory CE programs unnecessary. Finally, a systems approach would be needed to make the CoP model self-sustaining. Whenever a change is made, systems tend to push back because of homeostatic mechanisms.[45] In a self-sustaining social system, effort does not need to be expended to keep it going – people pursue individual goals, yet the system as a whole continues to work. One way to make an NCoP system self-sustaining is to construct the system in such a way that the didactic model will not work any longer.

CONCLUSIONS

This paper proposes that networks of communities of practice may provide a framework for professional education that could solve and prevent many of the problems currently encountered such as inadequate learning outcomes and lack of professionalism. Such a change would be profound because it would completely alter the goals of professional education and the methods used to attain them. In our current educational model, our "educational client" is the student and our "consumer" is the practice site that hires the student. In the NCoP model, our educational clients would be practitioners, ranging in expertise from the novice (the student) to the continually developing expert. Our consumers in the NCoP model would be patients and society.

While the advantages of NCoP are many, the adoption of such a model would require a profound transformation of the way we do business. Thus, the idea may seem impracticable. What is needed then is a concrete model or example of an implementation of the framework. The second paper in this series describes such an example.

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