Integrating information literacy into the education of public health professionals: roles for librarians and the library

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Objective: The paper reviews the core competencies for public health professionals presented in the Institute of Medicine's (IOM's) report, *Who Will Keep the Public Healthy: Educating Public Health Professionals for the 21st Century*; describes improving information literacy (IL) as a mechanism for integrating the core competencies in public health education; and showcases IL as an opportunity for solidifying partnerships between academic librarians and public health educators.

Methods: The IOM competencies, along with explicit examples of library support from a literature review of current IL trends in the health sciences, are analyzed.

Results: Librarians can play a fundamental role in implementing the IOM's core competencies in shaping public health education for the twenty-first century. A partnership between public health educators and librarians through a transdisciplinary approach is recommended.

Conclusions: IL skills and competencies integrated into public health curricula through a collaborative partnership between public health educators and librarians can help integrate the IOM's core competencies and improve public health education.

Highlights

- Exploring and solidifying transdisciplinary partnerships with public health educators and librarians through curriculum-integrated information literacy (IL) is one avenue to continue successful education of public health professionals.

Implications

- Librarians can be considered public health collaborators essential to the twenty-first century education of health professionals.
- Future research is required to effectively evaluate the best practices of curriculum-integrated IL into public health education.
- Transdisciplinary research is advantageous for achieving the shared goal of educating public health professionals.

INTRODUCTION

Information literacy (IL), heralded as the critical literacy for the twenty-first century [1], has been defined as the ability to recognize when information is needed and to locate, evaluate, and use effectively the needed information [2]. This conceptualization of the idea complements and reinforces the foundation of IL that academic librarians have been building on for the past twenty years [3]. Arising from the recent convergence of information and technology and a focus on best practices [4, 5], the emphasis on IL has necessitated that students in the health sciences develop IL-specific competencies.

The definition of IL was first mentioned in the literature in 1974 by Zurkowski, who asserted that those who were trained to use information and computer-ized tools were information literate [6, 7]. However, information literacy implies far more than computer literacy. Computer literacy can be construed as being skilled in and having basic knowledge of computer hardware and software [8–10]. IL encompasses this notion and a basic knowledge of information-searching strategies, coupled with an understanding of research resources. Additionally, critical thinking is utilized when evaluating information retrieved from these information sources.

Today's health care system is largely unprepared for the information age, and the need to address systemic deficiencies will grow more urgent over time [11]. The Institute of Medicine (IOM), Association of American Medical Colleges, American Medical Informatics Association, Association of College and Research Libraries (ACRL), and Medical Library Association have each spearheaded initiatives designed to improve IL [9, 12–16]. Given the number of information technology resources; the volume of information, estimated to double every two years [17]; and research linking education levels to health [18], it is no surprise that, in the field of health sciences, IL has become a universal educational outcome [10] and that it must be included as part of total curricular instruction [17].

In 2003, the IOM's Committee on Educating Public Health Professionals for the 21st century published its report, *Who Will Keep the Public Healthy: Educating Public Health Professionals for the 21st Century*. The authors recommend that schools of public health weave eight core competencies into curricula over the next five to ten years to meet twenty-first century challenges in research, training, and education in improving population-level health [9]: informatics, genomics, health communication, cultural competence, community-based participatory research (CBPR), global health, policy and law, and ethics.

The commission identified collaboration among dis-

Table 1
Institute of Medicine (IOM) competencies and librarian contributions to incorporating IOM competencies in public health education

IOM competencies	Examples of librarian contributions
Informatics	■ Integrate evidence-based medicine principles into information literacy (IL) courses that focus on accessing, selecting, evaluating, and utilizing information [22] ■ Collaborate with faculty with curriculum design to ensure inclusion of informatics competencies [23, 24]
Genomics	■ Instruct in genetic resources such as National Center for Biotechnology and Information and Genetics Home Reference [27, 28] ■ Deliver course integrated IL classes on genomics [29, 30]
Health communication	■ Emphasize the value of researching traditional and digital media for health information [31] ■ Incorporate data presentation into IL instruction [32]
Cultural competence	■ Develop assignments that tackle cultural competencies in credit-bearing IL classes [36] ■ Provide cultural-specific content to curriculum committees [37]
Community-based participatory research (CBPR)	■ Collaborate with faculty to develop CBPR assignments [40] ■ Travel to communities to deliver IL education [41] ■ Create community outreach centers for public health professionals and provide onsite community-based research instruction [42]
Global health	■ Include international bibliographic databases into IL instruction [33]
Policy and law	■ Discuss the importance of controlled term versus keyword searching and the need to search several databases in health research [46] ■ Incorporate critical appraisal of government and nongovernment resources and its effect on health care delivery [47]
Ethics	■ Incorporate the evidence-based approach to research and the ethical implications of not developing such proficiencies in professional practice [5] ■ Instruct classes that discuss the ethical uses of information including plagiarism [50]

ciplines as one of the greatest challenges in achieving curricular integration of these core competencies. Despite the fact that librarians are uniquely positioned to help public health programs include these areas in a curriculum [19], the IOM did not include library science as a discipline that engages in public health activity or librarians as potential collaborators in the effort to achieve their twenty-first century goals. This paper illustrates librarians' centrality to the academic preparation of public health professionals through explicit integration of IL instruction and the IOM's eight competencies and outlines the need for faculty-librarian partnerships (Table 1).

LIBRARY EFFORTS TO INTEGRATE INFORMATION LITERACY INTO THE INSTITUTE OF MEDICINE COMPETENCIES

Informatics

Informatics in public health is defined as the systematic application of information, computer science, and technology to public health practice and learning [20]. According to the IOM, a critical challenge in educating health professionals in informatics will be collaborating with those who are directly involved in this field [9]. The commission acknowledges the paradox of the information explosion: access to increased volume of information does not necessarily guarantee finding the best information on a topic. Moreover, the dissemination of incorrect health data could have a negative impact on the public's health. As Breivik presciently recognized over fifteen years ago, the primary challenge is not knowing how to analyze or synthesize information, but rather finding the most accurate and current information to synthesize and analyze to produce the best answer [21]. Therefore, informatics IL courses stress the importance of evidence-based medicine principles when accessing, selecting, evaluating, and using information systems that provide data to facilitate change in health research and practice [22]. In addition, librarians have collaborated with faculty to perform a major overhaul of medical and allied health curricula as a way to assess informatics instruction with a competency-based focus [23, 24].

Genomics

Genomics includes the study of individual genes and chromosomal disorders and the ways they affect individual and population health. Being able to find and manage information that identifies genetic factors that influence disease prevention and therapies is necessary for success in public health in the twenty-first century. The complexity of genomics and the rapidly changing body of literature and resources present a distinct challenge to information seekers [25–27]. Librarians, however, are uniquely experienced in knowing how to instruct in, communicate about, and manage such a vast array of resources [26, 28]. For example, projects such as Genetics Home Reference, a web portal designed for the layperson interested in human genetics [27], can be stressed in IL courses to ensure that public health professionals endorse such tools with appropriate audiences. Furthermore, librarians have an established record of incorporating sophisticated IL instruction in genetic resources, such as the National Center for Biotechnology Information databases, into academic undergraduate and graduate health education [29, 30].

Health communication

Public health professionals interact and communicate with a variety of different audiences and populations. To maintain their expertise and credibility, public health professionals must access and evaluate a variety of different information resources such as the web, scholarly databases, and mass media to be effective communicators. As information consumers and health educators, they must question known information, information that is not available, the agendas behind given information, and the ways to communicate and present this information clearly and responsibly to various audiences. Through IL, librarians help users develop the sophistication needed to find and assess information in multiple formats [31]. Librarians have also incorporated data presentation into IL sessions

and teach allied health students how to collect, export, and graph data [32].

Cultural competence

The goal of cultural competence in education is to prepare public health professionals to address the needs of different populations and cultures. One method is to illuminate information resources that provide access to cultural and community-based information [33] or culturally relevant and authoritative resources that reflect traditionally underserved communities [34, 35]. Librarians have also taught cultural competencies in IL classes through engaging students to grapple with cultural incompetence and health literacy issues by simulating what patients from other cultures may experience when given medical information in a language other than their own [36]. Finally, those responsible for curriculum design are calling on academic librarians to ensure that culturally relevant information resources are included in the redesign [37].

Community-based participatory research

CBPR is different than the two most common public health practices, individual client services and population-based public health. CBPR engages community members throughout the execution of a study while leveraging community strengths, knowledge, and resources to identify how society affects health in that community [38]. The methodology promotes active community involvement in the processes that shape research and intervention strategies, as well as in the conduct of research studies [39]. Faculty collaboration with academic librarians through IL is essential to the development and success of community-focused health assignments [40]. Academic librarians are not only educating health care professionals in the classroom to work with a variety of communities, but they are also traveling to different areas to perform their educational training [41]. For example, librarians have set up community outreach centers for public health professionals, providing onsite IL training on topics such as searching MEDLINE or population statistical resources [42].

Global health

Though the global health competency is far beyond the scope of the report, it is still necessary for public health professionals to be conversant with the challenges of these health issues. Librarians can elevate public health professionals' IL skills in this area through explaining the largely Western biases of heavily used databases such as MEDLINE and CINAHL [33]. Librarians are also familiar with resources produced by such bodies as the World Health Organization (WHO) [43], which tries to cover the areas missed by other databases. For example, WHO's website includes databases covering the following regions: Africa, Eastern Mediterranean, Latin America and Caribbean, and South East Asia. Another popular resource is IndMed [44], which is the predominant biomedical database that indexes Indian peer-reviewed journals. Librarians are also aware of new and beta versions of library tools such as EMCare, a bibliographic database that covers international journal titles in the health sciences [45].

Policy and law

One of the challenges of public health policy, as revealed in IOM's report, is that the development of policy research is far slower than scientific research. To minimize negative consequences of information gaps, public health professionals should be trained to assess a variety of tools, deconstruct and analyze information, and use the research to inform policy and practice. Librarians can help address these complex barriers by incorporating IL skills, for example, an understanding of searching techniques, such as using both controlled vocabulary and keyword terms, to obtain the latest research. Librarians can also alert public health practitioners to the wealth of available databases [46]. Librarians also teach the importance of critical appraisal of government versus nongovernment health information sources and to question the agendas behind the different publications [47]. Finally, research has shown that incorporating evidence from the heath sciences literature can influence health policy [48].

Ethics

It is argued that technological advances (whether information technology or genomics) have created more questions regarding the potential for unethical practice [49]. This, in turn, has led to greater concerns about public health ethics. The American Public Health Association has worked closely with public health professionals and ethicists from the Centers for Disease Control and Prevention, the Public Health Leadership Society, and public health academia to develop the ''Public Health Code of Ethics'' (Table 2). Four of the twelve principles in the code of ethics discuss the ethical uses of information in the realm of seeking, providing, acting on, and protecting confidentiality of information, respectively. Librarians are leading discussions on IL-related issues such as the importance of finding the most accurate and up-to-date information, moving beyond Google, employing advanced searching techniques, and finding evidenced-based research, so that one is best equipped to make the most informed decision [5]. Librarians have also taught courses that discuss plagiarism by defining what it is, what it is not, and how it can be avoided [50, 51]. ACRL states that it is the librarian's responsibility to communicate the importance of the ethical uses of information when accessing, evaluating, and using information in a way that is both responsible and legal [15]. Through IL promotion, librarians can help facilitate understanding of ethics and information and the ways they are related to professionalism and delivery of public health services.

DISCUSSION

Librarians, libraries, and IL have limited effectiveness without a change in relationships between teaching

Table 2
Principles of the ethical practice of public health

1. Public health should address principally the fundamental causes of disease and requirements for health, aiming to prevent adverse health outcomes.
2. Public health should achieve community health in a way that respects the rights of individuals in the community.
3. Public health policies, programs, and priorities should be developed and evaluated through processes that ensure an opportunity for input from community members.
4. Public health should advocate for, or work for the empowerment of, disenfranchised community members, ensuring that the basic resources and conditions necessary for health are accessible to all people in the community.
5. Public health should seek the information needed to implement effective policies and programs that protect and promote health.
6. Public health institutions should provide communities with the information they have that is needed for decisions on policies or programs and should obtain the community's consent for their implementation.
7. Public health institutions should act in a timely manner on the information they have within the resources and the mandate given to them by the public.
8. Public health programs and policies should incorporate a variety of approaches that anticipate and respect diverse values, beliefs, and cultures in the community.
9. Public health programs and policies should be implemented in a manner that most enhances the physical and social environment.
10. Public health institutions should protect the confidentiality of information that can bring harm to an individual or community if made public. Exceptions must be justified on the basis of the high likelihood of significant harm to the individual or others.
11. Public health institutions should ensure the professional competence of their employees.
12. Public health institutions and their employees should engage in collaborations and affiliations in ways that build the public's trust and the institution's effectiveness.

Note. From "A Code of Ethics for Public Health" [49].

faculty and librarians [31, 52, 53]. Librarians can work to inform teaching faculty of the need for change, especially in the arena of IL [54]. For example, librarians and teaching faculty can begin building partnerships by collaborating in the design of IL courses; such collaboration can provide a sense of cohesion for both parties because the design and delivery of IL sessions will not be constructed in isolation. ACRL reinforces this idea, noting that shared leadership and collaboration with effective planning is necessary for a successful IL teaching model [15]. Research shows that the library's presence and librarian's role is improved and enhanced by building collaborative teaching efforts [31, 55, 56]. Therefore, it is the librarian's responsibility to initiate teaching faculty's involvement with curriculum design. However, to have a successful and solid culture of collaboration between librarians and teaching faculty, there must be trust, shared goals, respect, strategic planning, and sustainability for carrying out the vision [57]. Due to its cross-disciplinary nature, the field of IL is an excellent arena for developing and solidifying such partnerships.

In public health, networking and developing partnerships are becoming increasingly important and necessary due to the limited and scare resources available to combat the disparate and complex problems affecting population health [58, 59]. Partnerships are also more efficient as duplication of work is minimized. Partnerships can improve the potential for discovering new and better ways of solving health problems because a shared commitment among different people and perspectives provides flexibility and freedom [60]. Sustaining partnerships requires commitment, dedication, and readiness, and only with trust, confidence, and a shared vision, mission, and values will the foundation be solid [58, 61].

One method discussed in the IOM's report for ensuring a broad range of activity from different disciplines is through a transdisciplinary approach to research. Transdisciplinary research implies research that transcends a single discipline or knowledgebase [62]. In contrast, a multidisciplinary approach signifies a discipline-specific team that performs and achieves separate assessments and goals [63]. Transdisciplinary research utilizes and relies on multiple faculties to work together as integrated teams and recognizes the value added when teammates share knowledge, skills, and responsibilities across disparate disciplines.

FUTURE INITIATIVES

One area of IL that needs further development is curriculum design. Research suggests that IL competencies must be taught continually throughout the semester with reinforcement and repetition [64]. However, initiating such a program requires strong library collaboration, resources, and systematic planning [65]. A curriculum-integrated approach is different from an ad-hoc or stand-alone, one- or two-hour course, as the development of IL competencies are closely integrated into the teaching, learning, and assessment of the overall curriculum goals and objectives [66]. Issues attached to the implementation of newly designed IL curricula include when to teach, how to structure, who will teach, what breadth of coverage, what assessments, and what sequence of classes [12, 13]. Current research into curricular-integrated IL approaches assesses the cognitive and critical thinking skills associated with information use, as well as the confidence acquired from repetitive, hands-on learning [66, 67]. While some research has shown that a curriculum-based approach does not always lead to a statistically significant increase in confidence among students [67], other research has found that a statistically significant improvement in self-confidence is directly associated with IL skills [7, 32, 54, 66, 68]. Such conflicting findings argue for a richer investigation. For example, performing both qualitative and quantitative evaluations measuring the impact of curriculum-integrated IL instruction on public health students' IL competencies would be a useful contribution to the literature.

CONCLUSION

An information society demands an information-literate population. Knowing how to effectively educate and prepare future public health professionals for information and technological challenges requires collaboration, curriculum assessment, and further research. IL transcends disciplinary boundaries by underscoring the unified goal between librarians and public health faculty; thus it is an excellent tool for achieving the IOM's eight core competencies and be-

coming a powerful catalyst for educational change. Librarians and public health faculty must share and engage in a transdisciplinary approach in implementing IL into the curriculum so that public health professionals are being educated to address future health- and information-related problems. Librarians have made strides toward integrating IL instruction into public health education, and further integration may help improve and alter the delivery of public health services.

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