Preface

My increasing interest in advancing health education through technology was consolidated after I heard about a tragic situation involving one college student trying to poison other students with “thallium” available only from their chemistry labs at Beijing University in 1997 prior to my coming to the United States to further my studies. Dictionary.com (2015) indicates thallium is used in science and its symbol is TI, a soft, malleable, very poisonous metallic element that is used in photography, in making low-melting and highly refractive glass, and in treating skin infections. Thallium has an atomic number of 81; its atomic weight is 204.38; its melting point is 303.5°C; its boiling point is 1,457°C; its specific gravity is 11.85; and its valence is 1. This information is available to anyone from the Periodic Table. At the time, thallium was not available at Chinese middle or high schools. It was available to only college students in the Department of Chemistry. Encyclopedia entries describe thallium as (TI), a chemical element, a metal of the main Group IIIa, or boron group, of the periodic table, poisonous and of limited commercial value. Like lead, thallium is a soft, low-melting element of low tensile strength. Freshly cut thallium has a metallic luster that dulls to bluish gray upon exposure to air. The metal continues to oxidize upon prolonged contact with air, generating a heavy non-protective oxide crust. Thallium dissolves slowly in hydrochloric acid and dilute sulfuric acid and rapidly in nitric acid.

At this time, I was a young college instructor who was able to attract students from other national universities such as Beijing University. These learners would enjoy discussing scientific topics such as health education and technology. No one would imagine that a professor of economics’ grandson, a student at Beijing University, was poisoned with thallium by another roommate. A few others were also poisoned, but their situation was more stable than that of the professor’s grandson. Thallium quickly took off all of his hair including bodily hair and his situation was critical. At the time, there were no medical means to provide a cure for poisoned patients. Finally, doctors turned to the last resort, the Internet technology. Email was just available in China. Doctors searched the Internet for a cure and tips came in from different countries, offering needed assistance. The professor told me in person that his grandson’s life was saved by a particular tip that came from France via the Internet technology. I still remember vividly how grateful he was when he described how his grandson’s doctors received that tip through the Internet from France. Suppose this tragedy occurred in a remote country where there was no Internet. One may say, this student would have been killed. A year later, the student fully recovered and came to North Carolina State University and secured a PhD in Chemistry four years later. He is now working in a national chemistry lab in the United States.
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A few years later in the United States, I found this tragedy was not an isolated case in China. There has been another “cold” case in which a student poisoned a gifted roommate at Qinghua University. This gifted poisoned student still lives in a wheelchair even to this day. She lost her memory at the time she was poisoned. The one who put thallium in her milk cup is living and working in the United States, a free “chemist.” Due to this chemist’s connection with top ranking communist officials, no agencies including the Chinese law courts were able to indict her. The former investigation was done in order to silence the poisoned student’s parents. Due to the amount of thallium in her milk jar, no technology or medical breakthroughs were able to help this most unfortunate student.

Then, in 2003, an American professor teaching in Northeast China contacted me, describing Chinese college students sweeping floors with mops as their “technology” in an effort to contain severe acute respiratory syndrome (SARS). I replied to this U.S. professor that China relied on “foreign technology” to advance domestic health education. Even to this day, in many of their hospitals in cities and country side, you will find “outdated technologies” imported especially from the United States. These technologies were used 30-40 years ago in U.S. hospitals.

As I continue to teach in university settings in the United States, many health care professionals such as experienced/registered nurses take classes with me, and I serve as their dissertation chair. I have learned from their research that researchers probe complex relationships between health, and biology, genetics, and individual behavior, and between health and health services, socioeconomic status, the physical environment, discrimination, racism, literacy levels, and legislative policies. Some researchers probe complex relationships directly between health and technology. There exist complex relationships between health and technology. The aforementioned cases with the malicious use of thallium in China were remedied by technology to a certain extent. Therefore, one can say technology is known as a determinant of health like other factors such as:

- A high-quality education;
- Nutritious food;
- Decent and safe housing;
- Affordable, reliable public transportation;
- Culturally sensitive health care providers;
- Health insurance;
- Clean water and non-polluted air (Disparities, 2014).

One may ask in what ways technology can advance health. This is the central theme of this book. Medical professionals depend on technology to detect hidden diseases and then use other technologies to nip them in the bud. Pharmacists depend on pharmaceutical technology to produce medicines to cure people’s diseases. No doubt, technology is an important way to promote health for all peoples. We cannot underestimate the power of Internet technologies, which have connected both medical professionals and researchers to search for solutions to health-related problems.

Unfortunately, no matter which country we live in, people do not seem to have health equity. Health disparities are based on factors ranging from ethnic group, religion, socioeconomic status, gender, age, mental health, cognitive, sensory, physical disability, sexual orientation, gender identity, or geographic location to other characteristics historically linked to discrimination or exclusion. In the United States, these health disparities have been further compounded by demographic disparities and other statistical facts:
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Of approximately 304 million American people:

- In 2008, approximately 33 percent, or more than 100 million persons, identified themselves as belonging to a racial or ethnic minority population.
- In 2008, 51 percent, or 154 million, were women.
- In 2008, approximately 12 percent, or 36 million people not living in nursing homes or other residential care facilities, had a disability.
- In 2008, an estimated 70.5 million persons lived in rural areas (23 percent of the population), while roughly 233.5 million lived in urban areas (77 percent).
- In 2002, an estimated 4 percent of the U.S. population aged 18 to 44 years identified themselves as lesbian, gay, bisexual, or transgendered individuals.

According to Food Research and Action Center (2014), obesity continues to be a leading public health problem in the U.S.:

- 68.5% of adults are overweight or obese; 34.9% are obese.
- 31.8% of children and adolescents are overweight or obese; 16.9% are obese.
- 30.4% of low-income preschoolers are overweight or obese.
- Disparities exist based on race-ethnicity, gender, age, geographic region, and socioeconomic status.

One of the best ways to combat health equity and solve public health problem is to provide health education through technology to everyone. All other determinants of health are further enhanced by technology.

INTRODUCTION

Health education and technology integration started in our primitive society. While modern doctors and nurses use cutting edge technology to treat terminal diseases, shamen in tribes still use a rudimentary technology to treat tribal men and women. Technology contributes to human health and longevity. The more technological advances people have, the longer people live. However, technology is just one factor leading to health and longevity. Health education is the catalyst that plays a crucial role in maintaining health and longevity. People living in the early 1900s could expect to live an average of approximately 50 years. Now American men live an average of 78 years and American women live an average of 80 years. This lifespan has been changed due to medical breakthroughs firmly supported by health education and technology integration. Health education and technology integration go hand in hand to advance medical breakthroughs.

One in 25 Americans was 65 or over at the turn of the 20th century. In 1994, one in eight Americans was 65 or over. The number of older adults (aged 65 and older) has increased 11 fold since the turn of the 20th century. As people age, researchers study successful aging by integrating technology; in this way, technology has contributed to longevity in our society. The number of adults over age 85 has quadrupled. The average life span in Japan is longer than that in the United States. Both Japan and the United States are more technologically advanced countries, emphasizing health education at the grassroots level.
China has not lagged behind. For example, China developed cutting edge technologies to contain severe acute respiratory syndrome (SARS) in 2003, and the World Health Organization declared that China has achieved the Millennium Development Goals target of reversing tuberculosis (TB) incidence by 2015 and has successfully eradicated malaria.

As the 70 million baby-boomers in the United States are beginning to retire, we are entering an adult-oriented society, if not an aging society, from a youth-oriented society. Health education and technology integration will become more and more important in maintaining a whole nation’s health and longevity. Health education takes many forms ranging from lifelong education, gerontology, health promoting exercises, nutrition education, lifestyles, literacy education, and clinical depression to medical education, nursing education and physical therapy. The ubiquitous computer alone cannot describe the sophisticated level of technology used to contain and treat diseases.

Such a timely and relevant volume would not be possible without the contributions from scholars/researchers and practitioners in the fields of adult education, medical education, nursing education, clinical psychology, biological science, kinesiology, and technology. Researchers and professionals were required to write chapters using a language that could be understood by scholars as well as the general public. This is based on the belief that health education and technology integration should be promoted at the grassroots level.

**OBJECTIVE OF THE BOOK**

_Handbook of Research on Advancing Health Education through Technology_ features full length chapters (around 12,000 words per chapter) authored by leading experts offering an in-depth description of concepts related to different issues, tools, methodologies, applications and trends in _advancing health education through technology_ at all levels in this evolving society.

**Organization and Impact of the Book**

Health education plays a vitally important role in improving people’s lives and promoting longevity. Unhealthy life styles could shorten people’s lifespan. Health education is noted for using cutting edge technologies and embracing the latest scientific discoveries to enable the best cures for diseases and the best means to enable early detection of most life threatening diseases. In developed countries, health education through technology has been promoted at the grassroots level. In some developing countries, health related agencies have been extremely slow to adopt the latest technologies to advance health education. While an individual’s health is affected by multiple factors, health education through technology does serve as a “catalyst” to help improve people’s quality of life and longevity in general.

Chapter 1, “The rural learning challenge: Meeting the health needs of rural residents through ICTs” by Al Lauzon, shows how technology is supporting the health and health care system for rural/remote people, specifically through telehealth and the Internet, with a focus on the Canadian context. Lauzon also explores the role of ICTs in health and health care with a focus on changes in the Canadian healthcare system, telehealth, and the Internet as a source of health related information. He concludes that ICTs present new opportunities for rural people and communities, but if they are to be able to take advantage of these opportunities they must learn to develop the necessary capacities, both as individuals and as a community. Their challenge is a learning challenge.
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Chapter 2, titled “Integrating technology in nurse education: Tools for professional development, teaching, and clinical experiences” by Vivian H. Wright and Anjanetta Davis explores how nurse educators can better integrate technology in their professional development, teaching and learning, and clinical experiences in a purposeful and meaningful manner. The authors explore how and why nurse educators should be mindful of the intersection of technology, pedagogy, and content knowledge (TPACK) in developing teaching and learning plans.

Chapter 3, “Knowledge in action: Fostering health education through technology” by Theresa J. Barrett, explores the possibilities and the challenges presented by technology in the area of patient education. Beginning with an overview of the use of the medical record in patient care, the chapter moves on to discuss the evolution of electronic health records (EHR) and the emergence of health information technology in the education of patients.

Chapter 4, titled “Parents and technology: Integration of web-based resources to improve the health and well-being of children,” by Sean W. Mulvenon, and Sandra G. Bowman, addresses the use of technology to improve the health and nutrition outcomes of children with many resources available online. They also provide a review of research and resources online to support parents with early childhood development in this chapter. In addition, the use for improved metrics and their development is provided.

Chapter 5, “Inclusive learning for the rural healthcare professional: Considering the needs of a diverse Population” by Sherry Kollmann and Bernice Bain, focuses on health care manager’s need to develop equal learning opportunities in rural communities. They argue that educational opportunities for healthcare professionals in the rural facilities often get overlooked and/or require more effort to obtain the same level of training as their urban counterparts. This chapter addresses many factors between the learner and the educator for the rural population.

Chapter 6, titled “Are adult women or men who use the internet as health information resource more health literate?” by Filiz Yıldırım and Metin Çakır, compares health literacy of adult men and women who use the internet for health purposes. The results showed that although the differences are not statistically significant, men used the internet for health purposes more often than did women.

Chapter 7, “The role of online health education communities in wellness and recovery” by Kathleen P. King, Julie A. Leos, and Lu Norstrand, discusses the powerful role of online health education communities in wellness, fitness, and recovery. This chapter explores whether adult learning principles are embedded in the design and operation of these popular virtual health education communities.

Chapter 8, titled “Narratives of integrative health coaching” by Jennifer Lynne Bird, indicates that integrative health coaching incorporates vision and values into the goal setting process in order for change to occur. The author argues while health coaches frequently work with healthy people who want to make changes in their lives such as finding time to exercise or getting more sleep, this narrative focuses on the role of a health coach when working with physical therapy patients at a hospital.

Chapter 9, “Literacy and decision making on health Issues among married women in South-west Nigeria” by Adejoke Babalola shows women lag behind in participating in decision making in Nigeria as the number of women in key positions is very low. The study addresses the level of women’s participation in health related decision making and investigates the effect of literacy on women’s participation in health related decision making.

Chapter 10, titled “Turning PAGES with health coaching and family involvement,” by Jennifer Lynne Bird, and Eric T. Wanner, provides a foundation for the PAGES family coaching program. PAGES is an acronym for practice, patience, accept the present, gather information, encourage, and self-care. The goal of their chapter is to introduce the reader to the PAGES program as a new initiative and to encourage reflection on how this information can be applied.
Chapter 11, “Diversifying clinical research participants: The potential role of health information technologies and online strategies” by Saliha Akhtar, Cynthia Israel, and Michelle Lee D’Abundo, shows that the diversification of clinical trial participants to include women and minorities is one of the biggest challenges for the clinical research industry. The authors explore how health information technology and online strategies can be applied in the clinical trial research process to increase the recruitment and retention of women and minorities in clinical trials.

Chapter 12, titled “Health information technology and change,” by T. Ray Ruffin, argues that in health care and health information technology, change will continue to take place. Technology, civilization, and creative thought will drive this force increasingly forward. The pace of change has significantly increased since the days of the cave dweller who walked the earth until the “technology convergence” of using the ox and horse as tools. This chapter investigates the background, controversies, and problems surrounding Health Information Technology and change, and includes an overview of current changes.

Chapter 13, “Flavonoids: Prospective strategy for the management of diabetes and its associated complications” by Vineet Mehta, M. Pharm and Udayabanu Malairaman, shows diabetes Mellitus is one of the major healthcare problems faced by the society today and has become alarmingly epidemic in many parts of the world. They argue the need of the day is to develop alternate strategies that can not only prevent the progression but also reverse already “set-in” diabetic complications. In the present chapter they have convened different flavonoids beneficial in diabetes and co-morbid complications and discussed their mechanisms of action.

Chapter 14, titled “Physical health promotion through modern technologies: Challenges to concerns” by Sandul Yasobant, explores health promotion and the maintenance of quality of life. The author indicates that advancements in technologies offer new possibilities for both the promotion of positive health behaviors that were unimaginable even a decade ago. Though promoting physical activity has been proven an important component of health promotion by many researchers, a lot of effort on how to improve physical activity still needs to be provided through research. Technology such as pedometers, accelerometers, and heart rate monitors have been used to promote physical activity for years.

Chapter 15, “Mental activity and the act of learning in the digital age” by Michael A. DeDonno, posits theories of the mind that have been proposed since the Greek philosopher Plato (427 – 347 B.C.) compared memories to etchings on a wax tablet. While theories of the mind have been proposed for thousands of years, it has really been in the last twenty-five years that we have truly begun to uncover the complex association between the mind, brain, and thought. With the advent of the digital age including new imaging technologies, the author argues that we can explore the act of learning like never before.

Chapter 16, titled “Emerging role of technology in health education for youth” by Amir Manzoor, shows that Information Technology (IT) produces a significant impact on the emotional and social health of young people. This chapter reviews the current state of youth sexual health and the role of digital landscapes in health education of youth. Various implications and recommendations are provided for optimizing technology use in young people health education.

Chapter 17, “An education driven model for non-communicable diseases care” by Fábio Pittoli, Henrique Damasceno Vianna, and Jorge Luis Victória Barbosa, argues that patients with chronic diseases should be made aware of their planned treatments as well as being kept informed of the progress of those treatments. This chapter discusses in depth a model titled the Chronic Prediction Model and how this model should be utilized to aid patients.
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Chapter 18, titled “Principles of instructional design for e-learning and online learning practices: Implications for medical education” by Erdem Demiroz, indicates that the dramatic transition from the post-Flexnerian model to the models of 21st century requires pedagogical practices such as teaching techniques, methods, and strategies to be modernized in order to address the diverse needs of 21st century medical students. E-learning and online education applications provide enriched opportunities for redesigning health education, and they are widely discussed in life-long learning, self-directed learning, and competency-based instructional practices.

Chapter 19, “An intelligent and secure framework for wireless information technology in healthcare for user and data classification in hospitals” by Masoud Mohammadian, Dimitrios Hatzinakos, Petros Spachos, and Ric Jetzsch, indicates that data with utilization and application of the latest technologies in hospitals around the world can improve patient treatments and their well-being. TSecure and accurate real time data acquisition, the analysis of patient data and the ability to update this data will assist in reducing cost while improving patients’ care. A wireless framework based on radio frequency identification (RFID) can integrate wireless networks for fast data acquisition and transmission, while maintaining privacy.

Chapter 20, “Assessing online courses in health education: Training a 21st Century health workforce” by Debra Weiss, examines Internet-based health education for two related purposes:

1. To train a global health workforce of nurses, physicians, health educators, and other health workers, and
2. To educate the public about disease prevention and management (for example, during outbreaks of SARS in China and Ebola in Africa).

This chapter posits that assessment of online health education is vital to maintain quality control and to share best practices.

In summary, technology is being used to help advance every field of study and health education is not an exception. The chapters in this book will be useful for students, academics, and professionals alike in their efforts to further their own health and the health of others within our communities and society. To sustain one’s health, education and technology play a vitally important role and these education and technology remain inseparable twins to help improve the health of our society and promote people’s longevity.

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REFERENCES