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Book Review

Healthcare and Biomedical Technology in the 21st Century: An Introduction for Non-science Majors

Baran, G. R., Kiani, M. F., & Samuel, S. P. (2013). Healthcare and biomedical technology in the 21st century: An introduction for non-science majors. New York, NY: Springer. ISBN: 978-1-4614-8540-7, $89.99 (Paperback); ISBN: 978-1-4614-8541-4, $69.99 (eBook), 503 pages.

Science education for nonscience majors in university settings has generally been focused on teaching basic science courses (e.g., physics, chemistry, biology) with the expectation that students will retain and internalize these concepts in the long run. However, student responses to these courses have often been less than enthusiastic, and a number of universities have begun to develop general education curricula focused more on applied science, technology, and engineering covering current topics of interest. As a professor in a community college dealing with a large number of students, majoring both in sciences and nonscience areas, I have been impressed with how Healthcare and Biomedical Technology in the 21st Century successfully covers and presents the state of the art in medical technologies and related issues. Professors Baran, Kiani, and Samuel are recognized experts in many of the fields covered in this book and have used their personal experience of teaching this material for several years to a large number of students (Fagette, Chen, Baran, Samuel, & Kiani, 2013) to assemble an excellent textbook. Although the subtitle of the book claims it to be "an introduction for non-science majors," this textbook is certainly appropriate for science majors in an introductory or review course on medical technology. Furthermore, this book has excellent background material for even engineering students who may be interested in reviewing the state of the art and possible problems that individuals in this field face. In particular, many insightful discussions and practical examples in the book on how advances in medical technology have impacted social change and clinical care provide excellent context for understanding biomedical technology. This book is written in a "continuing education" style, beginning each chapter with a summary and presenting the material in a didactic manner, including questions that would allow the reader to evaluate their understanding of the material. Most chapters are generously scattered with helpful diagrams, photographs, tables, and practical examples to illustrate the content. In general, the text is well laid out, clear, and appropriate. Each chapter ends with a very useful listing of foundational concepts that summarize the material covered in the chapter and a

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list of references.

The book is divided into two overall segments. In the first four chapters of the book, the authors introduce healthcare policy and the ethical and legal aspects of technology-centered healthcare in the modern world and discuss the scientific method in the context of how scientists and engineers develop new ideas and technologies. Chapter 1 delves into the controversies surrounding the delivery and cost of healthcare in the United States and does not shy away from addressing controversial topics such as how the healthcare system and outcomes in the United States differ from other industrialized countries. Nevertheless, these controversies are presented in a way to encourage debate and discussion in class and allow for students to form their own opinions on the subjects. Chapter 2 presents the scientific method and provides much practical insight on how students can use the scientific method in their daily decision making. Chapters 3 and 4 present a very accessible introduction on the legal and ethical issues arising from the applications of technology in healthcare covering topics such as animal and human experimentation, regulatory concerns for drugs and medical devices, and end of life decisions. Very interesting examples of a scientific grant proposal, a patent application, and an informed consent form are included in the appendices at the end of the book. Overall, this portion of the book provides the students with a solid understanding of the central role of technology in modern healthcare.

The second segment of the book, Chapters 5 through 14, covers a significant part of the modern technology that is at the center of modern healthcare in very simple yet comprehensive language. These chapters, although complementary, are written in a way that allows instructors the flexibility to choose topics of interest to their students or of special interest to the instructor, without necessarily having to cover all chapters in a serial fashion. Furthermore, the breath of material in each chapter allows the instructor to adjust the depth of presentation depending on the background of the students. Chapter 5 covers medical diagnostic and bioimaging technologies and presents many of their applications through examples that should be familiar to many students. Chapter 6 presents a discussion of how different tissues in the body interact with various materials and provides a basic understanding of issues such as transplant rejection. Chapters 7 and 8 present an in depth discussion of biomaterials and their applications not only in medical devices but also in any material that may come into contact with the human body. The technology behind cardiac devices such as stents, pacemakers, and artificial hearts, as well as their applications, is introduced in Chapter 9. Chapter 10 provides an interesting discussion of how modern drugs are formulated with many examples that even a younger student population should be able to find in their medicine cabinets. Chapters 11 and 12 cover the very hot topics of genetic and tissue engineering, including gene therapy and stem cell technology. Chapters 13 and 14 are very applied in tone

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and cover the applications of technology in dentistry and rehabilitation engineering. The variety of topics and the amount of material covered in this book is probably too much for a typical one semester science course, but it also gives instructors considerable flexibility because most chapters could stand alone.

In summary, this is a well-organized textbook that covers an emerging area of general education. For STEM (science, technology, engineering, and mathematics) educators, this will provide an excellent textbook for teaching applied science courses to nonscience majors, particularly because the topic of medical technology involves anyone who has ever been a patient or has a family member who has interacted with the healthcare system. This text seeks to demystify many of the medical diagnoses and treatments encountered by patients. The book may also be useful for teaching an introductory course to science majors on the applications of modern technology in healthcare. There is a shortage of appropriate textbooks in these areas, and Healthcare and Biomedical Technology in the 21st Century is a very welcome addition to the field.

References

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