Rationale
Modern health care is increasingly dependent upon technology. Health care workers must be able to select appropriate equipment and instruments and use technology for specific tasks.

Objectives
Upon completion of this lesson, the student will be able to:
- Identify technology utilized in the pharmacy
- Describe how technology applications improve efficiency in the pharmacy
- Analyze the use of technology in the pharmacy

Engage
Set up a math race. One student will solve the problem with pen and paper and the other with a calculator. Discuss the results.

Key Points
Teacher Note
If possible plan a fieldtrip to a variety of pharmacies, e.g., small individually owned community pharmacy, a chain store pharmacy, and a hospital pharmacy, to have students exposed to variety of technology available. Alternatively have students make their own arrangements to visit community pharmacies in small groups of 3-4 students. Or, the instructor could contact the pharmacies to take photographs of pharmacy equipment.

I. Electronic technology is influencing and being influenced by the healthcare professional. It is an all-encompassing field of managing, maintaining, and manipulating data through state-of-the-art hardware and software.

II. Pharmacy practice is notably influenced by computerization.
   A. Specialized software packages help reduce medication errors by alerting to
      1. drug interactions
      2. contradictions
      3. patient allergies
      4. cross allergies
      5. special warnings
      6. dose limits
      7. duplications
B. Databases maintain patient profiles; can be easily updated and reviewed for irregularities

C. Computers provide consistent patient education and assist pharmacists in patient counseling

D. Computers enable managers to control budgets and inventory; purchasing efficient and convenient by ordering online

E. Billing third-party payers electronically saving costs
   1. paperless environment
   2. faster reimbursement

F. New drugs easier to "create" by use of computer; any drug can be displayed in 3-D and structure can be manipulated on screen to literally see the outcome

G. Special pharmacy software developed to
   1. calculate formulas for IV solutions
   2. analyze peak and trough measurements for medication, e.g., gentamycin
   3. prepare medication schedules, e.g., Medical Administration Record Sheet (MARS) in hospitals

H. Communication software in the pharmacy
   1. prescription ordering, e.g., prescriber to pharmacy; prescription drug orders transmitted electronically by variety of media
      a. facsimile (fax)
      b. e-mail – e-prescribing
      c. voice mail
   2. drug information storage
   3. information retrieval
   4. information transmission
   5. Internet refill

III. Legal implications--data encountered will cover drugs, reimbursement, patient information. Laws protect privacy and patient confidentiality; practitioner needs to maintain ethical and professional obligations to protect patient's rights to privacy and confidentiality.

IV. Comp-utilization signifies the utilization rather than mere operation of computers.
   A. Dispensing of medication automated through robotics
   B. Parenteral formulations and IV admixtures are calculated, formulated, and prepared by computerized equipment known as compounders
   C. Computers also utilized in
      1. unit dose packaging
      2. drug repackaging
3. labeling
D. Bar codes read by scanners
E. Drug information processed by computers
F. In clinical fields computers are utilized to
   1. collect drug data
   2. analyze drug data
   3. store the data for future retrieval or processing
G. Technology used to provide clinical and business information used to assist practitioners and management in making business decisions

V. Benefits--In addition to accurate calculations, very fast processing and extensive amounts of memory, software enables practitioner to practice with
   A. Enhanced safety
   B. Enhanced accuracy
   C. Enhanced uniformity
   D. Consistency

VI. Computers as resource--Networks of databases provide many online resources
   A. OncoLink provides cancer information, trials, and research
   B. sites for clinical trials, disease management, and scientific information

Activity
I. Complete the Technology in the Pharmacy WebQuest.
II. Write a report on a piece of technological pharmacy equipment. What is the purpose of the equipment? Why did it have such an impact on you?
III. Conduct a round-table discussion about the benefits and disadvantages of the enormous impact of technology in the healthcare field, specifically in the pharmaceutical setting.

Assessment
Technology in the Pharmacy Quiz
Writing Rubric
Materials
Medical equipment catalogues to visualize compounders, flowhoods, etc.
Computer with access to Internet
KEY - Technology in the Pharmacy Quiz

U.S. Food and Drug Administration
http://www.fda.gov/

Virtual Pharmacy Field Trip
http://cte.unt.edu/content/files/HS/tours/pharmacy/

Accommodations for Learning Differences
For reinforcement, the student will create an educational poster emphasizing the impact of technology on the healthcare professional.

For enrichment, the student will individually create a format suitable for patient database, e.g., patient profile format, to be used in the pharmacy.

National and State Education Standards
National Health Science Cluster Standards
HLC 10.01 Technical Skills
Healthcare workers will apply technical skills required for all career specialties. They will demonstrate skills and knowledge as appropriate.

TEKS
130.205(c)(7)(A) Interpret knowledge and skills that are transferable among health science professions
130.205(c)(7)(C) Analyze emerging technologies in the health science industry

Texas College and Career Readiness Standards
English Language Arts
III. B. Develop effective speaking styles for both group and one on one situations.

Science Standards
IV. A. 1. Recognize how scientific discoveries are connected to technological innovations.
IV. C. 1. Understand the historical development of major theories in science.
IV. C. 1. Recognize the role of people in important contributions to scientific knowledge.

Social Studies Standards
Interrelated Disciplines and Skills
I. B. 2. Identify and evaluate sources and patterns of change and continuity across time and place.

Cross-Disciplinary Standards
I. E. 2. Work collaboratively.
II. E. 1. Use technology to gather information.
Technology in the Pharmacy WebQuest

1. Locate five (5) popular technological devices used in the pharmacy. Describe both advantages and disadvantages of the devices.

<table>
<thead>
<tr>
<th>Technological Device</th>
<th>Manufacturer</th>
<th>Hospital Pharmacy or Community Pharmacy</th>
<th>Advantages</th>
<th>Disadvantages</th>
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</table>
2. How does electronic prescribing work?

3. What are the advantages and disadvantages?

4. How are computers contributing to new drug discoveries?

5. What is OncoLink?
Technology in the Pharmacy

1. List 5 (five) areas of concern specialized software packages can help reduce medication errors by alerting the practitioner:
   a. _______________________
   b. _______________________
   c. _______________________
   d. _______________________
   e. _______________________

2. What are two ways billing third-party payers electronically can save money:
   a. _______________________
   b. _______________________

3. Describe how computers can be utilized in “creating” new drugs more easily.

4. What is the general term for the computerized equipment that is used to calculate, formulate, and prepare parenteral formulations and IV admixtures?
   _______________________

5. Identify three media by which prescription drug order can be transmitted electronically.
   a. _______________________
   b. _______________________
   c. _______________________

6. Complete the following statement regarding the benefits of using software and computers in the pharmacy:
   In addition to accurate calculations, very fast processing and extensive amounts of memory, software enables the practitioner to practice with
   a. _______________________
   b. _______________________
   c. _______________________
   d. _______________________
KEY - Technology in the Pharmacy

1. - drug interactions
   - contraindications
   - patient allergies
   - cross allergies
   - special warnings
   - dose limits
   - duplications
   (Any 5 in any order)

2. - paperless environment
   - faster reimbursement

3. any drug can be displayed in 3-D and its structure can be manipulated on screen to literally see the outcome (recommend ½ point for each key term)

4. compounder

5. - facsimile (fax)
   - e-mail on computer
   - voice mail by telephone

6. - enhanced safety
   - enhanced accuracy
   - enhanced uniformity
   - consistency
# Writing Rubric

Student: ________________________________  Date: ________________________

<table>
<thead>
<tr>
<th>Scoring criteria</th>
<th>4. Excellent</th>
<th>3. Good</th>
<th>2. Needs Some Improvement</th>
<th>1. Needs Much Improvement</th>
<th>N/A</th>
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<tr>
<td>The writing has all required parts, from introduction to conclusion, in smooth transition.</td>
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<td>The writing is interesting, supportive, and complete.</td>
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<td>The writing demonstrates that the writer comprehends the writing process.</td>
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<td>Accurate spelling, grammar, and punctuation.</td>
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<td>The content of the paragraphs emphasizes appropriate points.</td>
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<td>The writer shows an understanding of sentence structure, paragraphing, and punctuation.</td>
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<td>All sources and references are clearly and accurately documented.</td>
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**NOTE:** N/A represents a response to the performance which is "not appropriate."