IT as Language and Content

Moursund, D.G. (February 2000). IT as language and content: Powerful ideas shaping our educational system. *Learning and Leading with Technology*. Eugene, OR: ISTE.

In my September 1999 editorial, I listed 10 powerful ideas of information technology (IT) in education. (Read them online at www.iste.org/L&L.) Each of these powerful ideas cuts across many disciplines, makes effective use of IT, and has enduring value. Powerful Idea 5 is addressed here.

Logan (1995) argues that IT is a *language*—the fifth in the series that begins with natural language, reading/writing, mathematics, and formal science. What is particularly interesting about the third and fourth languages—mathematics and formal science—is that each is both a "language" and a content area. For example, the language and tools of mathematics are inextricably intertwined with its content.

IT as language and the discipline of computer and information science are, of course, inextricably intertwined. But, IT has emerged as an aid to representing and solving problems in academic areas outside computer science. Thus, we have an entirely new phenomenon.

IT is becoming an integral component of both the language and the content of every academic discipline. This is gradually changing what it means to know and work in the various academic disciplines.

**Some Examples**

The spreadsheet was originally developed for use in business, and it certainly has changed the content of business courses. However, the spreadsheet is useful in representing and helping solve problems in a wide variety of disciplines. For example, a spreadsheet can be used to represent population data, do computations on the data, and draw graphs using the results of the computations. Because of its capability, the spreadsheet has affected the content of math, science, social science, and other subjects.

Geographic information systems (GIS) are a powerful aid to problem solving in geography, cartography, environmental engineering, and related fields. (GIS are spreadsheet-like, specifically designed for creating graphical representations of data stored on or with maps.) GIS contribute to major changes in ways of representing and solving a wide variety of social science, science, engineering, and environmental problems.

In math, we have long had powerful math problem-solving and manipulation systems such as Mathematica and Maple. Many secondary school mathematics courses now make routine use of handheld calculators that can automatically graph functions or solve equations. These and similar powerful tools are now routine parts of the ways of understanding and using math throughout all areas of science and engineering.

Graphic design software has completely changed mechanical drawing and graphic artist coursework. Musical Instrument Digital Interface (MIDI) software and related hardware have changed the music industry. Desktop publishing software has changed the publishing industry.
Computer-based animation and computer-based editing have strongly affected the movie industry. In each of these examples, the content of the discipline and how one solves problems in the discipline are becoming inextricably intertwined with IT.

Some Implementation Ideas

These teaching ideas focus on IT as interdisciplinary language and content.

1. Each academic discipline is characterized by the types of problems it addresses, its accumulated body of knowledge, its specialized vocabulary and methodology, its ways of knowing and doing, its history, and so on. Divide your class into teams. Each team is to select a different discipline and develop a presentation that clearly defines the discipline and illustrates how the content of the discipline is being affected by IT. Some variations:

   a. Students can be assigned to teams on the basis of courses that they are taking from other faculty. Thus, for example, the First-Year Algebra Team would explore how IT is integrated into the content of algebra and specifically how it is affecting the content of the course they are taking.

   b. Broaden the scope of disciplines or areas that students can select. Examples of areas that might be studied include sports, collecting (e.g., coins, stamps, trading cards), games, travel, and retail selling.

2. Many disciplines make use of special symbols or notation in their writing. For example, music uses musical notation, math uses a wide range of special math symbols, and foreign languages use diacritical marks and a variety of symbols not in the English alphabet. Divide your class into teams. Each team is to select a discipline and explore the symbols and notations that are common to the discipline but are not routinely used in other disciplines. Then, the team is to find and learn to use desktop publishing software that includes the symbol set. They are to explore how this software has changed publishing within the discipline. Hint: Many word processors (such as Microsoft Word) contain very extensive symbol sets.

3. IT helps non specialists in a particular field solve some of the complex problems of their field. For example, a spreadsheet contains a variety of graphing routines, statistical routines, and computational formulas. Students can use these routines without having the knowledge and skills of how to carry them out by hand. A computer system can accept music as input and produce musical notation as its output. The Global Positioning System (GPS) can pinpoint one's location on earth. There are a huge and growing number of artificially intelligent expert systems that have come into routine use. Working individually or in teams, develop a bulletin board display and/or whole class presentation of such examples. Quite likely, you will want to use scanned images and those downloaded from the Web. This project might extend throughout a semester or year.

4. Working in teams or as a whole class, develop a generic list of modes of communication that cut across all disciplines and that are facilitated by IT. E-mail, desktop publishing, desktop presentation, and interactive hypermedia
are examples. Also, make a list of the general areas of study provided in your school.

a. Rank each course area taught in the school on the basis of the relative value of each of these modes of communication for understanding and working in the discipline.

b. Then, working in teams, explore the nature and extent to which each general area or department in the school facilitates, encourages, allows, discourages, or does not allow students in their classes to make use of these aids to communication

c. We are familiar with writing across the curriculum. Have your class select an IT-based communication mode, such as hypermedia. The class then works on a whole-school project (for example, hypermedia across the curriculum), encouraging and facilitating all teachers in the school to help their students gain increased fluency in this mode of communication.

**Final Remarks**

IT is of growing importance within the content of each academic discipline. Therefore, each teacher needs to help his or her students learn how IT is affecting the disciplines he or she teaches. School wide and district wide planning and coordination are needed in this endeavor, with a special emphasis on articulation across different courses and grade levels.

**Resources**

Maple is available from Waterloo Maple, Inc. Find out more by visiting www.waterloomaple.com or calling 800.267.6583 or 519.747.2373.

Find out more about Mathematica by calling 800.441.MATH or 217.398.5151 or by visiting Wolfram Research’s Web site at www.wolfram.com.

Word is available as a stand-alone product or as part of Microsoft’s Office suite from your local software reseller or at www.microsoft.com.

For more on geographic information systems, visit www.geoinfosystems.com, and for more on the Global Positioning System, visit www.gpsworld.com.

**Reference**


Dr. David Moursund (dmoursund@iste.org) has been teaching and writing about information technology in education since 1963. In 1979, he founded the International Council for Computers in Education (ICCE). In 1989, ICCE merged with the International Association for Computing in Education to form ISTE. He currently serves as executive officer for research, development, and evaluation.

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