Role of Technology (1990)  

Technology can improve learning through the use of: software tools, the Internet (as a resource or laboratory), learning objects (systematically designed learning resources to enhance the learning process), and learning systems (systematically designed systems that facilitate the holistic development of learners with expanded dimensions of learning experiences).

Learning Objects, Learning Systems, and Online Learning

Pacific Crest Software, Inc. (later, Pacific Crest, Inc.) began its corporate life as a technology company offering among its catalog of products the modeling and problem-solving software Point Five and PC:SOLVE.

Point Five was an “interactive mathematical scratchpad that supports calculations, statistical analysis, modeling, graphics, and applications development” (Aarons, 1986). PC:SOLVE was a modeling language consisting of seven tools for use in problem solving: a mathematical toolbox, a relational data management tool, a graphing system, a modeling language, a report writing tool, a statistical analysis system, and a high-level programming language (Beyerlein, Ford, & Apple, 1993).

In the course of providing customer support to our end users, it became clear that many professionals who used these systems regretted not having had the same software resource to help them become more effective problem solvers when they were in college. Pacific Crest then decided to put our technology, teacher training, and resources to work in supporting higher education by helping those in educational settings improve learning and problem solving.

Within five years, Pacific Crest built a large population of technology users (over 500 site-licensed colleges) who then built libraries of learning objects and learning systems for use in statistics, physics, calculus, and quantitative methods courses (Pacific Crest, 1992).

While so much of what we do is web- and browser-based, it is critical to recall that prior to 1990, all Internet browsers were text-only (Berners-Lee, 2015). In conjunction with the rapid evolution of the Internet and other technologies, the strictly text-based online learning systems of the 1990s gave way to more sophisticated course management systems (CMS). In response to the evolution of CMS technology, Pacific Crest offered the Interactive Learning Systems Booklet (Apple, 2000) to coach authors and designers in building learning systems that implemented and/or supported the principles of Process Education; this also included an analytical rubric for rating interactive learning systems (Apple, 2001). Shortly thereafter, Pacific Crest took the next step and created the Interactive Learning Systems Institute to help faculty and professional staff in higher education develop this same expertise with learning systems technology (Apple & Krumsieg, 2002).

Inspired by this work, Wolfskill and Hanson at Stony Brook University obtained grants to develop the LUCID system for learning and assessment (Learning and Understanding Through Computer-Based Interactive Discovery), publishing the results of their work in the article, LUCID — A New Model for Computer-Assisted Learning (Wolfskill & Hanson, 2001).

Building interactively upon the work of Hanson and Wolfskill, Apple and Krumsieg produced the specifications and methodologies for designing quality online courses (including hybrid or blended courses) and effective interactive learning systems, published in the Interactive Learning System Handbook (2002). In 2013, Stony Brook University expanded its use of the LUCID system to apply to all of its 1,500+ general chemistry students; it built a learning laboratory capable of accommodating 192 learners working simultaneously in groups of 3 (Stony Brook University, 2015; see Figure 1). It is worth noting that this lab looks very similar to the lab described in the article, Developing a Laboratory for Process Education (Evans, 1998).
Institutes Online

Since the 1990s, Pacific Crest has offered a variety of professional development institutes at physical campuses throughout the United States, bringing faculty together for intensive workshops focused on different aspects of Process Education. In 2011, a version of the Teaching Institute was first made available online and presented at the 2012 Process Education conference in a poster session titled, The Teaching Institute from Pacific Crest: Taking it Online (Hintze, 2012; see Figure 2).

In 2014, Pacific Crest adapted Learning to Learn: Becoming a Self-Grower (Apple, Morgan, & Hintze, 2013) as an online course, offering a version for students as well as a version for instructors or mentors to work with as part of the training for a learning to learn camp. Another version of this same online course was created and first used in 2014 to help train faculty to facilitate the improvement of learning and academic performance in students who were on academic probation or at risk for dismissal.

The current Online Teaching Institute (Figure 3) is web-based, runs on a Moodle platform, and makes use of interactive discussion forums, interactive forms, image map navigation, online quizzes, and linked and embedded readings. It challenges participants to explore how technology affects the practices of Process Education (e.g., in one activity, participants are asked to envision and describe online adaptations of more familiar face-to-face learning interventions); it also challenges them to explore new and different tools in order to improve their ability to plan, collaborate, report, and learn (Pacific Crest, 2015). While the virtual environment may be more inviting and user-friendly than what was first offered nearly 23 years ago, the goal of any interactive learning system used to deliver a Process Education-based learning experience remains exactly the same: to design and use technology so that it best implements and/or supports the principles of Process Education.
References

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