Objective

eCornell's mission is to help professionals who take our online courses meet their development goals by making available to them first-class content from Cornell University. This white paper describes our approach toward designing effective and engaging online learning systems to deliver that content.

What Do Learning Molecules Help Us Do?

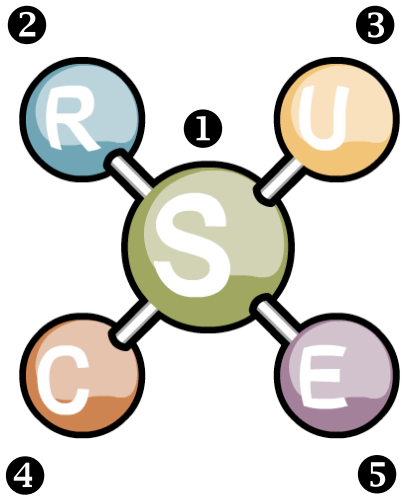
Translating rich content from a face-to-face environment to an online environment poses two major challenges: developing a pedagogical strategy suitable for learning in cyberspace that maintains the integrity of the content, and applying a production model that ensures success in this complex endeavor. Key to succesfully confronting both challenges is a clear process of communication between eCornell, acting in the capacity of online learning experts, and our faculty partners from Cornell University, acting in the capacity of subject-matter experts (SMEs).

Whereas the process of creating a classroom course is oftentimes the responsibility of a single person (the instructor), designing and creating an online course is a complex team process involving not only the SME, but also learning designers, content architects, interactive media programmers, project managers, and many other people without whom it would be impossible to deliver an online learning product. Such a process necessarily imposes organizational constraints such as production timelines, budgets, contracts, and other business considerations. Thus, to guarantee the success of the project, we need a shared understanding of the project's objectives (what we want the learners to be able to do) and parameters (what it is possible to do given the available resources), as well as a common language to communicate what the SME feels is the most effective way to organize the content and what eCornell feels is the best online learning strategy to deliver it.

As a way to fulfill these needs, eCornell has created the Learning Molecule model: a flexible, learner-centered, online learning approach that serves four important functions. First, it uses the metaphor of a molecule to help organize the content and conceptualize the learning experience. Second, it supports an object-oriented approach to the design of individual parts of a course, while providing a framework for maintaining the pedagogical integrity of the whole. Third, it provides a systematic way of organizing reusable interactive-media templates for building online learning tools. And fourth, it provides a set of metrics for calculating the effort it will take to produce a course, and the time it will take the learner to complete it.

A Common Language

An eCornell learning system can consist of one or more learning molecules. Each learning molecule has five components, or "atoms," which provide a structure for organizing content and define a self-contained learning experience.



		Description	Examples
❶	Scenario	Sketch of an authentic situation that provides the **context** and **motivation** to learn.	A question A problem A case study
❷	Resource	Material that provides the theoretical knowledge necessary to **understand** and **solve** the scenario.	A lecture An article A graph A demonstration
❸	Utility	Tool that facilitates the cognitive **application** of knowledge.	A job aid A checklist A process flowchart A calculator A simulation
❹	Collaboration	Tool that allows communities of learners to **share, compare,** and **construct** knowledge online.	A discussion board An email A chat A survey
❺	Evaluation	Instrument that measures the **effectiveness** of the learning experience.	A test An exercise A simulation

Our Approach to Online Learning

In the real world, we are assigned or take on a task, then we seek the information and resources we need, when we need them, to enable us to complete that task. eCornell courses are constructed the same way. In the **Scenario**, learners are presented with a problem to solve, an activity to accomplish, or an assignment to complete, and are then given a list of informational **Resources** to help them complete it.

eCornell recognizes that learners come to our courses with varying levels of experience and expertise; some will require more support than others to help them complete the activities and assignments. Thus, learners are invited to pick and choose the resources they need and the level of support they require to be successful. In other words, they can access the informational resources at any time, taking advantage of all, some, or none of them according their needs.

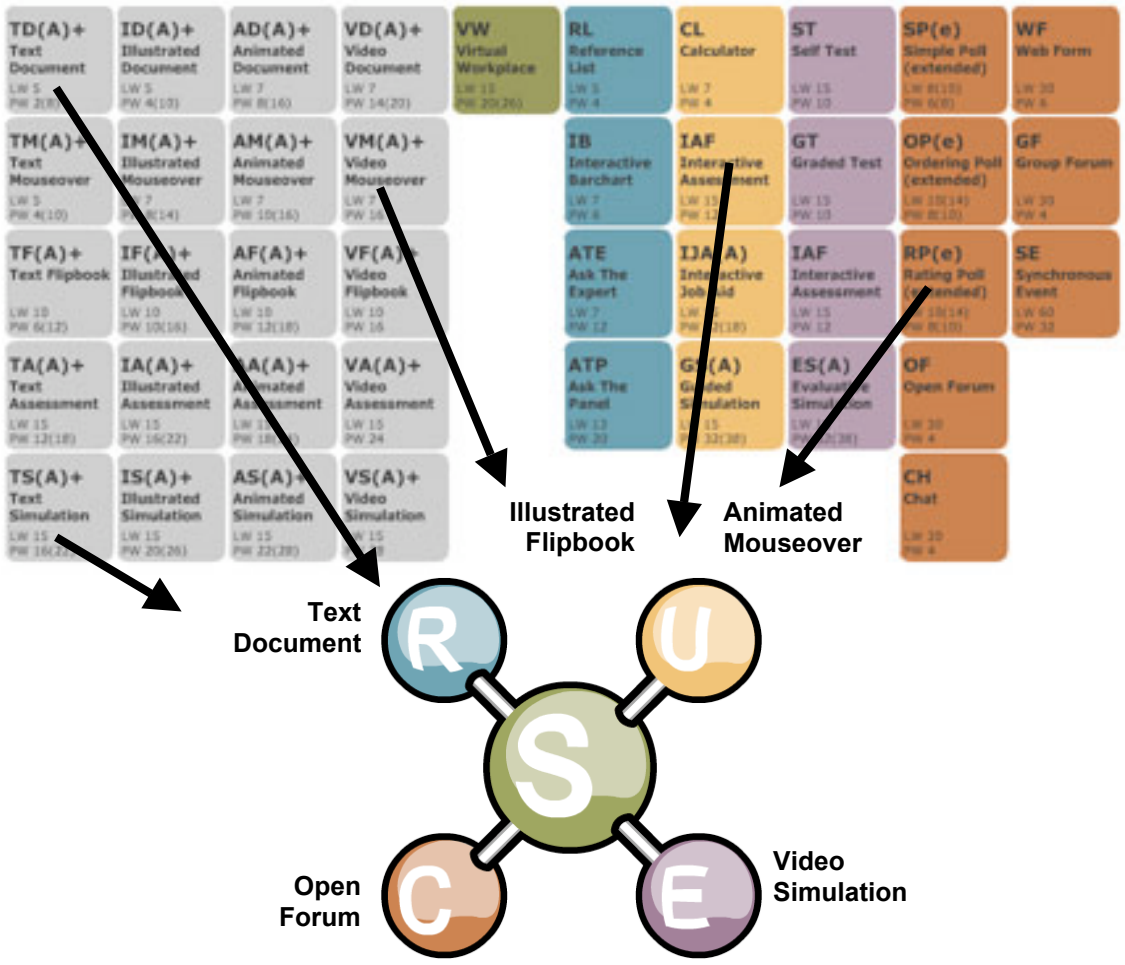
Through **Evaluations**, learners have the opportunity to make choices and experience their consequences in a risk-free environment, enabling them to develop the skills they need to perform effectively on the job. For example, learners might make a series of decisions within the context of a simulated situation, experience the likely consequences of those decisions (different decisions result in different outcomes to the simulation), receive feedback on the strengths and weaknesses of their decisions, and may choose go back and try again if those decisions have resulted in an undesirable outcome. Learners also have access to **Utilities**: job aids they can use to solve the current problem, and that can also be applied in real-life situations when confronting problems of a similar nature.

Wrapping the whole experience are various **Collaboration** elements: opportunities for learners to discuss the problem, share professional experiences, or interact with an eCornell instructor. Collaboration is the glue that holds the learning experience together, providing the richness and depth that only human interaction can provide.

First and foremost, eCornell believes that people learn from interacting with other people, not just with computers, and our learning philosophy is aligned with this important principle. Our approach positions students as active participants in the learning process, allowing them to build the necessary problem-solving skills to confront the challenges they face on the job, while giving them flexibility in accessing content at their own pace and in a manner that conforms to their individual learning styles. Instead of passive receptacles of information, learners become active participants in their own education, developing and practicing new skills in a safe, engaging, collaborative online environment.

Toolset

A learning molecule, which is the equivalent of a topic in a course, is constructed by assigning a learning tool to each scenario, resource, utility, evaluation, or collaboration part of the molecule. Our set of interactive learning tool templates is called the Periodic Table of Online Learning Elements. The illustration below shows how different elements from the periodic table are applied to a specific part of the learning molecule.



The elements in our periodic table represent templates that have been conceptualized, developed, and tested as we design online learning courses. These elements bring together sound pedagogical and usability principles, superior interface and graphic design, and state-of-the-art technology. They are also developed according to an object-oriented approach, which means that the content, the look and feel, and the technology are kept separate. This maximizes the potential for reusing these elements by simply plugging in new content, designing a new look, or changing the technological parameters to fit a different purpose. The Periodic Table of Online Learning Elements is not a definitive set, and new elements are being "discovered" and added constantly.

Set of Metrics

Each element of the periodic table is assigned two numbers (analogous to the concept of atomic weight in organic chemistry): learner weight and production weight. The learner weight is an estimate of the amount of time a learner will spend engaged on that particular part of the learning molecule. Because one of the advantages of online learning is that learners may spend as long as they wish working on a particular section, this number is merely an average. It is used to control how long the typical learning experience should take.

The production weight measures the effort involved in producing a particular element, taking into account both SME and eCornell effort. Because producing an online learning system involves the work of many people, it is important to establish a system to measure and control how resources are allocated.

These two numbers allow us to design a course that does not exceed pre-determined length and resource limits. For example, it might be agreed that a four-week course will have a total learner weight of 12 hours and a production weight of no more than 560 points. Knowing this before the course is even designed helps set expectations and define project parameters. If the initial design exceeds those limits, the Learning Molecules model provides a method for bringing the weight of the course down to the appropriate levels. Because the periodic table contains elements of various weights that can fulfill the same learning objective, the process of reducing the weight of the course does not compromise its quality.

Conclusions

By implementing the Learning Molecules model, eCornell forges a new path in online learning, a path where sound pedagogical principles are combined with state-of-the-art technology, powerful collaboration tools, and world-class content from Cornell University.

For more information, visit our website at www.ecornell.com, or call (607) 330-3200.