

**The Case Files**  
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The Case Files is a National Science Foundation funded project designed to produce a readily accessible inventory of case studies and professional development workshops to help faculty implement case studies in their technology classes. This project is built on two previous projects that explored techniques for training faculty how to use authentic case studies that incorporate the “Case Files Learning Cycle” defined by project partners from the Learning Technology Center at Vanderbilt University.

Four case studies were developed and tested in colleges and universities throughout Tennessee and surrounding states in the previous projects. Assessment of student learning showed that students transfer the knowledge they gained to new situations better than those students learning the same technical material via traditional classroom activities.

Specific goals of the Case Files Project include the following:

- Provide technology faculty (100 total) with new strategies for delivery and development of case studies.
- Develop an inventory of case studies and case ideas to be conveniently accessed by faculty.
- Broadly disseminate case ideas and highly sophisticated cases for technological education.

This presentation will define problem based learning using case studies and show assessment results to verify that the method does result in enhanced student learning and transfer of knowledge. Ways in which faculty across the country can benefit from this project will also be explained. These ways include participation in two types of workshops and the authoring of case file manuscripts. Informational workshops are approximately ½ day in length and help faculty understand the advantages of using cases studies in their curriculum. More detailed Authoring Workshops will prepare faculty members to design and develop their own case studies which can be submitted for publication and dissemination through the project infrastructure.

Case studies have been used in educational settings in many professional fields. Engineering Technology faculty are only beginning to use this problem based learning approach. The Case Files Project will help equip faculty with the knowledge, resources and materials they need to successfully adopt case study methods in their classrooms.

The aim of the Case Files project is to create opportunities for students to learn technical concepts and skills using a problem based approach to authentic situations as they can occur in the world of work outside the confines of the classroom. While cases in a traditional sense offer students an opportunity to examine how a problem was solved. The approach taken in the Case Files project is more one of a “case based problem solving” approach. Based on decades of research and practice led by Dr. Howard Barrows in the field of medicine, a problem-based approach requires students to build a case as a result of solving the problem. Barrows argues that this approach is much more in keeping with the way real problems are addressed in the world outside of school <sup>1</sup>

As a result of Barrow's influence the development team from NSTCC in cooperation with researchers from Vanderbilt designed a framework for thinking through the process of developing and delivering a case. The Case Files Learning Cycle, shown in figure 1 below, is a framework that serves as a development tool for instructors and business partners, a delivery device for instruction and a process grid for students who actually work the case.

## The Case Files™ LEARNING CYCLE

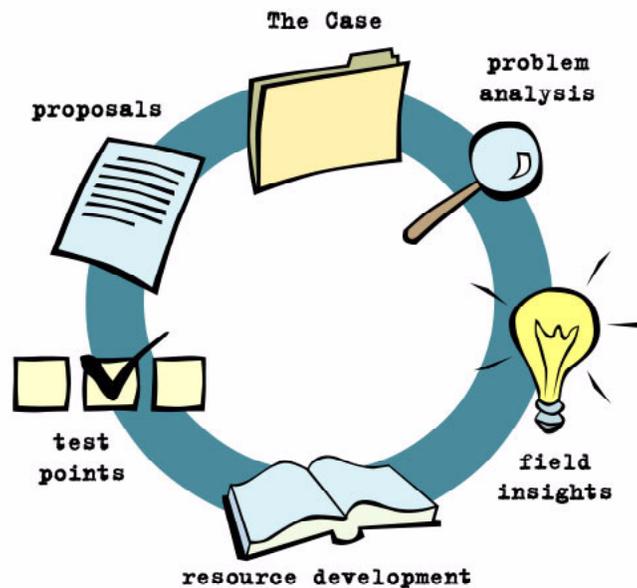


Figure 1

The Learning Cycle is set in the context of an active learning environment that assumes high levels of reflection throughout the experience. An awareness of the real world of complex problems sets a tone for learning that allows students to take risks in their learning process; ask questions that may or may not have immediate answers; pose solutions that may or not be workable; and interact with one another as collaborators in the process of acquiring knowledge and skills while making connections. The overall environment in which cases are set provides support for investigation and helps students develop the habit of reflecting on their progress.

**The Case** provides an overview of the circumstance, situation, or problem. This section sets the context for the case. It is a complex problem that students solve in order to acquire new knowledge and skills. Sequences of challenges present similar problems in different contexts to help students abstract the important underlying principles and thinking processes. The case contains only the information that would be available in the real world. The task requires the use of the target skills, knowledge, and resources. Successive challenges grow in complexity.

**Problem Analysis** allows students to explore the possible problem identification or solution. Students often work collaboratively here. A key feature of problem analysis is brainstorming ways of defining and solving problems. Generating and sharing ideas helps students to identify and organize relevant facts, notice missing information, and contrast ways of solving a problem.

**Field Insights** moves students to a wide range of expert knowledge available through a variety of sources. They can choose video, audio, or text explanations of subject matter presented by leading experts, or they can seek out experts on their own. A critical piece of this stage is to explore multiple perspectives regarding the case itself. In solving a complex case, students are often overwhelmed by the amount of new information. Contrasting different perspectives and ways of approaching or thinking about a problem is one way to alert students to important points they may have overlooked. Experts can suggest alternatives and address misconceptions, difficult concepts, or critical information. The purpose is not to give a solution but to inspire exploration.

**Resource Development** is the point at which students are asked to research information needed for the case. Case-based instruction differs from traditional approaches in its focus on collaborative research, the use of resources and tools, and its emphasis on frequent assessment, feedback, and revision. Research tasks focus on learning that prepares students for future learning. Students learn how to solve classes of problems rather than isolated cases. In research tasks students create and communicate initial solutions that are revised on the basis of feedback.

**Test Points** requires students to assess their progress, knowledge, understanding and/or their lack of knowledge. Traditional tests are summative: tests that come at the end of a process to evaluate learning. Test Your Model offers formative assessment opportunities to guide students to the next steps in the learning process. Comprehensive practice tests provide detailed feedback on where and how to improve.

**Proposal** is the summative point when communication skills are honed as students present results in both written and oral form. This stage offers students the opportunity to celebrate the results of their effort and learning. Refinement and clarification of their work show up in clear, innovative, accurate, and effective analysis of the problem and presentation of a workable solution. Final products or revised solutions are presented to and evaluated by an outside audience. The product can be a written report, oral presentation, a demonstration, a product or any other authentic event.

Use of problem based cases has led to changing roles in the classroom for teachers and students. The instructor evolves from *designer* of case study to *coach* to students during implementation of the case study in the following way:

- ✓ The instructor designs and engages students in an example scenario and models a problem solving sequence using the Learning Cycle.
- ✓ The instructor empowers students as investigators in the case study, both implicitly and explicitly affirming their control of the Learning Cycle process, while serving as the “metacognitive” guide or coach for the process.
- ✓ Teacher coaches from the sidelines as students move toward the generation of possible

solutions to the proposal for the problem resolution.

The student's role evolves from *receiver* of the case scenario and participant in the model being introduced as preparation for the case study to being a *self-directed learner* during the implementation of the case study in the following way:

- ✓ Students are drawn in by an intriguing problematic situation and are engaged by the problem solving process.
- ✓ Students are empowered to investigate needed information, pursue logical lines of inquiry, and be active in their search for understanding. Students are coached and supported as they become self-regulated learners.
- ✓ Motivated by the problem that centers all learning in the problem-based case study, students apply knowledge, skills, and habits of mind to meaning and authentic activity. Students develop as self-directed learners and problems solvers who are highly employable and valued in the workforce.

Analysis of student achievement levels when using problem based cases indicate that students do retain information and transfer knowledge and skills to novel situations more effectively when learning within the type of environment described in the Learning Cycle than in the tradition lecture/lab only situation. However, instructors require professional development to support their ability to design and deliver such instruction.

The Case Files project includes extensive professional development opportunities for those community college faculty members across the nation who are committed to learning the problem based case study method of curriculum design and instruction. Awareness workshops are offered to as an orientation to the basic philosophy and framework of the process. Authoring Workshops along with on-site coaching further equip faculty to design, use, and publish cases that are problem based and student centered.

## Reference

1 Barrows, H. S. (1999b). Short Paper for a SEATEC Case Study Forum on "Strategies for Using Case Studies in Teaching and Learning." [http://www.nsti.tec.tn.us/seatec/pages\\_resources](http://www.nsti.tec.tn.us/seatec/pages_resources)

## Biographies

James Johnson is Dean of Business and Technologies at Nashville State Technical Community College. He has extensive experience at the community college level and industry. His degrees include an Ed.D. in Education, and MS in Physics, and BS in Secondary Education. He has developed and disseminated numerous innovative programs that connect education with business.

William Kitchen is Associate Professor of Electrical Engineering Technology at Nashville State Technical Community College. In addition teaching experience at ITT Technical Institute in Nashville and Middle Tennessee State University in Murfreesboro, he has business experience in a number of communication companies as technician and engineer. He holds a Masters in Engineering Technology.