THE NYSCATE FOCUS on Informed Design: A Pedagogical Strategy for Teachers

FOCUS is a pedagogical model that is intended to concentrate your attention on a small set of roles that are central in teaching students to employ an *informed design* process in meeting a "design challenge." FOCUS is an acronym that serves well in ordering, emphasizing, and helping to remember these important teacher roles. The order in which the roles are presented in the model approximates the order in which they dominate as you proceed through the instructional process. As a complement to the FOCUS model for teachers, a model of informed design has been developed to provide scaffolding to students as they undertake design solutions. Note: Terms in boldface print are explained further in the glossary following the model.

Focus

Organize

Coordinate

Unite

Sum Up

Focus Students on the Problem Context Initially, you have to FOCUS and engage the attention of students.

■ Presenting a practical **problem-solving** context with which students can identify serves this purpose. The context directs attention to a human need, which might be addressed through designing a product or method for doing something.

■ The task for the student is formulated as a **design challenge.**

■ The challenge includes the specifications for what is to be accomplished and the constraints under which the work is to be done. Students should be made aware of the resources they will and will not have available and how long they will have to work.

■ At this point, you should present and discuss the design challenge with students, until you have made clear what is being asked of them.

Organize for Informed Design Once the students understand the challenge, your FOCUS should shift to getting students started on an organized path. At this point, momentum can easily be lost if you do not provide sufficient structure based on the students' prior experience with the informed design process.
You should:

■ Introduce or review the phases of the **informed design process,** contrasting the more formal and planned approach of "informed" design with the everyday, spontaneous approach to design with which students may be familiar.

■ Form **design teams** and set the ground rules for team interactions.

■ Inform students of the type of **record keeping** to be used: logbook or Design Journal (DJ), lab book or Design Folio (DF). Emphasis should be placed on keeping complete and accurate records of individual thinking, actions, and results.

■ Specify how **student assessment** will be accomplished, including what will be graded and the criteria and standards to be used.

■ Students sometimes have developed a natural familiarity with and affinity for designing. Unfortunately, they often seem to prefer trial-and-error methods. To overcome this tendency, you should establish the expectation that science and mathematics principles are to be applied to the problem solution.

Coordinate Student Progress Once the work of design teams has been launched, you should FOCUS on coordinating the effort and facilitating what teams and individuals are trying to accomplish as they proceed through the informed design process.

■ Teams will need time, physical resources, knowledge and skills, and encouragement along the way, all of which you can help to provide.

■ **Resource management** can be one of your most time-consuming responsibilities. Students must have access to materials, equipment, and working space when they need it if they are to gather data on factors influencing solutions, build prototypes, and test ideas.

■ Your timely introduction of the **Knowledge and Skill Builders (KSBs)** provided in the module can be an especially important facilitative role.

■ After the design teams have made some progress, you should gather the class together so that teams can share tentative solutions and problems.

■ Continually monitoring individual student roles and contributions to their team effort as well as conducting checks of students' individual written records is an essential task if you are to keep these student responsibilities from becoming a problem.

■ You may have to give special attention to **females and underrepresented minorities** to encourage them to participate in this type of task, which some may feel does not draw upon their strengths. The fact that students are working in teams must not distract from your responsibility to help each student learn.

■ Conveying a general sense that you enjoy student interchanges and feel that they are important can encourage students to respond in positive ways and remain engaged.

Unite the Class in Thinking about What Has Been Accomplished
As the teams' efforts to meet the challenge draw to a close, your FOCUS should shift to uniting the class once again to reflect on and learn from the accomplishments of each other.

■ Each student can benefit from seeing the strengths and weaknesses in both the process and products of others' work and from having their own work critiqued in a supportive environment.

■ To realize these benefits, students need an opportunity and sufficient class time to present their work in a formal way. If time permits, both a **design team presentation** and an individual **written Design Report** can be prepared. For purposes of NYSCATE pilot- and field-testing, both the reports and the presentations are requirements for students. (The design presentation may be oral or in the form of a poster display.) If these efforts will be graded, students should be informed ahead of time of the criteria to be used.

■ You may wish to shape this assignment so that it provides an opportunity 1) for students to produce high-quality, on-time work, 2) for all students to apply their language arts skills, and, for those with limited skill in technology but special strengths in language arts, a chance to contribute, 3) for students to learn to use writing and presentation technology, 4) for students to realize the importance of good record keeping, 5) for student self-reflection on abilities, knowledge, work habits, and motivation, 6) for representation of work forms that can be graded, and 7) for preserving students' best work for use in an academic portfolio.

Sum Up Progress on the Learning Goals
Your final FOCUS must be on summing up progress toward meeting the learning goals. Both the individual students and the effectiveness of instruction should be evaluated.

■ You should keep in mind that the design challenge is a means to an end in accomplishing the learning goals. Reviewing the module's learning goals periodically can help you stay on track during the module and during its assessment.

■ Holistic experiences such as working on design challenges can have many benefits. Improvements may be seen not only in abilities but also in **conceptual understandings** in technology, mathematics, science, language arts, and general problem solving. The grading system could capture any of these improvements.

■ For your **assessment** of students, the goal is to be constructive. Emphasizing student progress and identifying specific areas for improvement are recommended. Several tools for this purpose are supplied with the module or in the *Pedagogical Framework*; these include process-rating forms, content tests, and preliminary product-scoring rubrics.

■ Ultimately, you have to combine the various methods of assessment to arrive at a grade that is consistent with the methods of grading you presented to students during the organizing phase of the module.

■ Knowledge of student progress on learning goals can contribute to a general evaluation of the module and the instruction used. This evaluation should be completed to guide improvements for the next time. Keeping teaching notes or a journal during the use of the module can be very helpful in this process.