Sample Lesson Plan

DAY 1	Students should begin to work through the Exploring the Nanoworld Kit, completing the worksheet that accompanies this activity as they proceed. This will likely require more than one period.
DAY 2 15-20 min	Finish the activity from DAY 1. It is important that students complete this activity in a manner that allows them enough time to examine the materials in the kit thoroughly and to reflect upon their observations. It should not become a "busy work" activity.
5-10 min	Discuss the observations made by the students and clarify any questions on the worksheet as necessary. Avoid at this time a great deal of discussion as to the nature of these materials or "how they work".
20-30 min	Have students do Investigation 1.
DAY 3 15 min	Discuss the results of Investigation 1. Collect the observations on the board and use them to stress the difference between observation and inference as well as qualitative versus quantitative observations.
35 min	Use follow-up question (2) to begin a discussion of memory metals. You should present the material in the background information section of this unit through the treatment of structural defects.
DAY 4	Before students attempt Investigation 2, it is necessary that they have a good understanding of what constitutes a <u>unit cell</u>. Appendix A contains a development of this concept using traditional two-dimensional arrays. This topic is further extended in the Teacher Notes for Investigation 2. Models or overhead projections of the unit cells will be helpful. Be sure to emphasize that some atoms in a structure are shared by more than one unit cell and the fraction belonging to a given cell must be determined.
DAY 5	Have students do Investigation 2.
DAY 6	Discuss Investigation 2. Questions 5 (b) and (c) will require that you point out that the difference between the two structures amounts to layers of atoms in the austenite structure experiencing both a sliding and shearing motion to arrive at their locations in the martensite structure. There is a <u>slight</u> change in density of the structure (<0.5%) and <u>substantial differences</u> in properties such as flexibility, hardness, and acoustic signature.

DAY 7 Have students do Investigation 3.
10-15 min

35-40 min Class discussion of how the austenite-to-martensite transition occurs. Also discuss the mechanism of how the memory can be changed. See the Notes for the Instructor.

DAY 8 Have students do Investigation 4.

DAY 9 Discuss Investigation 4. See the Notes for the Instructor. You may want to do problem 1 from the Memory Metal Review Questions Worksheet.

DAY 10 Have students do Investigation 5.

DAY 11 Discuss the results of Investigation 5. See the notes for the
5-10 min Instructor.

45-50 min Pre-lab Experiment 1. Review the steps in the scientific method and encourage your students to keep them in mind as they develop a procedure to determine the transition temperature range for a sample of NiTi.

Provide class time for the students to "brainstorm" their procedures and make sure they understand that they are to show you their procedures for approval before proceeding.

DAY 12 After approval, have students do Experiment 1. If you have anticipated likely approaches to this problem, you will probably have most of the equipment that the students request already at hand. (See the Notes for the Instructor). It may, however still require more than one class period for everyone to finish.

DAY 13 Discuss the capabilities and uses of memory metals. Recall
15-20 min Investigation 1, question (4) and ask your students if any other applications have come to mind now that they have completed this unit. Also, distribute the Memory Metal Review Questions Worksheet and allow students the remainder of the period to discuss it in small groups.

DAY 14 Discuss the In-Class Discussion Question from the previous day. Have the small groups share their ideas with the entire class. Also, continue reviewing the unit by completing the Memory Metal Review Questions Worksheet.

DAY 15 Unit exam (See the Memory Metal Assessment at the end of the unit).