



## DISTANCE LEARNING SUPPORT FOR NATURAL APPROACH TO CHEMISTRY

August, 2020

Lab-Aids publishes and distributes *A Natural Approach to Chemistry* (Hsu and Chaniotakis, 2018). The full program consists of a student book, student lab investigations manual (LIM), teacher's guide for both student books, lab equipment including the Lab-Master probeware system, and online digital resources to support the program. Like all our programs, NAC features a direct experience or "hands-on" approach to teaching science. We provide the following short overview and ideas for teaching the program remotely during the COVID-19 pandemic.

**Access to the online resources.** You will need to purchase individual access for the teacher and student accounts so that you and your students can take full advantage of the digital ancillaries available. Your sales representative can assist you with this.

*Having trouble with online access?* Please view our comprehensive FAQ page here <https://www.lab-aids.com/portal-faq>; and you can always contact us through the link at the bottom of the page.

### TEACHER SUPPORT

The complete TE can be accessed through your individual account login (<https://www.lab-aids.com/login>). You can navigate through the Teacher Resources in several ways<sup>1</sup>:

- Using the Page finder in the document header,
- Using the thumbnails in the document footer,
- Using the forward and back arrows ( < > ) on the document sides,
- Using the left-hand NAVIGATION bar; or
- Clicking the buttons that are displayed on Page 1 and throughout the TE. These buttons allow you to download the complete TE, SE, LIM, all PowerPoints, Pacing Guide, NGSS correlation, equipment refills, and more.

Please review the front matter (pp. vi - xl), with special attention to the program pedagogy (xxiv – xxxv) which calls out the 5E approach. Note the lab safety section (xxxvii – xl) for when you are able to meet F2F with students again!

Each of the chapters includes a pacing section for the SE and LIM, and teaching notes, followed by separate sections on using the labs and student book.

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<sup>1</sup> See also <https://www.lab-aids.com/past-portal-webinars> for other navigation tips

**Lab prep videos.** From the Teacher's Resources view, VIDEOS will display all the lab prep videos for the lab investigations from Chapters 1-15, and a few others. The videos, while designed for teachers, contain segments you might want to edit and share with students since they cannot carry out the labs to see the results. "A" labs (e.g., 1A, 2A, 3A, etc.) have no prerequisite content and can be used to start a chapter, if desired.

**PowerPoints.** From the Teacher's Resources view, DOCUMENTS will display the PowerPoints for all the labs (1A, 1B, etc.) and SE sections (e.g., 1.1, 1.2, 1.3, etc.) for your use. These slide decks are comprehensive, visually pleasing, and can be edited to add new content or to hide slides, if desired. These can be used in real time with students in a stand-and-deliver lecture mode, if you prefer, and there is a version of the slides that has been converted to an audio-visual student PODCAST that can be shared with students (more on this later).

**Assessment, Homework, and Roster tabs.** From the DASHBOARD > TEACHER RESOURCE navigation bar view, there are tabs for assigning homework, adding your class roster, and managing assessment. From Assessment > Standard Tests, note that you will need to CLONE or save a copy of a standard end-of-chapter test to a local drive before you can edit or modify items. The end-of-chapter review sections contain hundreds of items dealing with conceptual and quantitative understanding. You also have the ability to create and save a variety of new item types to support special-needs students.

## STUDENT SUPPORT

There are two student texts, the STUDENT BOOK and the LAB INVESTIGATION MANUAL. Each has different supports for students.

**Student edition and Lab Investigation Manual.** In general, navigating the Student Edition is very similar to the Teacher's Edition – you can move using the header and footer tools, the forward and back arrows (< >) at the side, or use the buttons. Page One has an option to download the entire student book for offline reading or access in areas where Internet access is difficult or unreliable.

The left-hand navigation tools provide more options. Clicking CONTENTS allow students to move through the student book sections, on a chapter by chapter basis. Clicking RESOURCES allows you to view videos, which contain student podcasts of Chapters 1-15. The podcasts are mp4 files based on the student book PowerPoint files, with audio narration, and with on-screen drawing and notes. These files can be paused and replayed and provide differentiation options for students who don't easily extract meaning from informational text.

The DOCUMENTS option provides access to student worksheets and simulations from Molecular Workbench, a Concord Consortium effort funded by NSF, that we have aligned to each of the NAC chapters. The student worksheets are generally provided at three levels: basic, applied, and advanced and provide additional practice for students. PAGE ONE in the Teacher's Edition has a link to the answers to these sheets.

The online lab investigation manual provides access to the content from the hard copy student resource. The following link provides access to a black-line master version of the complete LIM, as a pdf, to use as you like:

<https://docs.google.com/document/d/1aYZwyDK671yU0Cg6uBO6lOXtnBckJBcTNwh2Xi4AGSs/edit?usp=sharing>. Some teachers carve up this pdf to share individual labs with students through their local LMS.

## **IDEAS FOR REMOTE INSTRUCTION**

If the course is designed around NAC as the main resource, you will likely use the program content and features differently than if the course is used to supplement another text or program. Regardless, at the local level, teachers will need to first align the NAC content to the local chemistry program syllabus or scope and sequence.

Teachers using the program as the main resource, and teaching at a distance, generally describe one of the following scenarios, after they have mapped out a quarter, semester, or the entire school year on paper:

- If a more traditional approach is desired, teachers use the included PowerPoint files to drive a short online lecture, to be followed up by assigned problem sets from the end of chapter (CHAPTER REVIEW), which is divided by smaller sections like the chapter itself. Where used, lab video content is presented and moderated by the teacher, and the students can fill in data table information using the blackline masters, above.
- If a less traditional format is desired, teachers can use the student podcasts as the chief content delivery tool, assigned offline – as homework, perhaps – to be followed up with assigned end-of-chapter problems. Instead of a large group lecture, teachers use dedicated online class time to view labs, work out problems (you can never have enough time to do this!), or to assign and review other content, such as the Skill Sheets.
- Often, teachers will take a hybrid approach, possibly using a large group lecture format once weekly, or where needed, supplementing with podcasts and lab clips. Generally, an online notebook of some kind is used to record and display student work, if an LMS is not used.

This Google Doc will be modified throughout the 2020-21 school year, and we will post new content, program updates and student work samples from cooperating teachers to “crowdsource” the use of this program.

## **SAMPLE ONLINE TEACHING APPROACH**

### **CHAPTER 2, “Matter and the Elements”**

This sample treatment is based on the Scope and Sequence (NAC TE, p. 42.43) and Pacing Guides (available from Page 1 as a pdf download). The time given for this chapter varies from 1-2 weeks. Each of the major concepts treated in Chapters 1-4 (the Fundamentals) is revisited in depth in later chapters,

so avoid the tendency to want to teach to mastery -- if so, you will never make it past chapter 4 by the Winter Holiday break!

The first two tables provide details on major concepts and where they appear later in the text, and suggestions for pacing if a traditional lecture mode is desired. Additional suggestions for aligning the lab content to the student book section content are provided.

PowerPoint Presentations			
Concepts	Concept Mapping	Lessons	Investigations
<b>Section 2.1 - Matter and the Elements</b> <ul style="list-style-type: none"> <li>Substances and mixtures</li> <li>Physical and chemical properties</li> <li>Physical and chemical changes</li> <li>Macro- and microscopic scales</li> </ul>	<b>Prior knowledge:</b> This is the first introduction to these concepts. <b>More depth:</b> Specific heat (Sec 3.2), phase changes (Sec 3.3), physical and chemical changes (Chap 4), water and solutions (Chap 9), properties of gases (Sec 14.1) <b>Additional coverage:</b> Physical properties of solids and liquids (Chap 16)	NAC_Ch2_Sec1.ppt (Slides 1–13)	NAC_Inv2A.ppt Mixtures
<ul style="list-style-type: none"> <li>Atoms and elements</li> <li>The periodic table</li> <li>The mole</li> </ul>	<b>Prior knowledge:</b> This is the first introduction to these concepts. <b>More depth:</b> Solving problems with moles (Sec 2.2), structure of the atom (Chap 5), elements and the periodic table (Chap 6)	NAC_Ch2_Sec1.ppt (Slides 14–33)	NAC_Inv2D.ppt Density
<b>Section 2.2 - Molecules and Compounds</b> <ul style="list-style-type: none"> <li>The chemical formula</li> <li>Molecules and compounds</li> </ul>	<b>Prior knowledge:</b> This is the first introduction to these concepts. <b>More depth:</b> Covalent bonds (Sec 4.1, 7.1, 7.2), geometry and structure (Sec 7.3), molecular formulas (Sec 8.4)	NAC_Ch2_Sec2.ppt (Slides 1–17)	NAC_Inv2B.ppt The Chemical Formula
<ul style="list-style-type: none"> <li>Ionic compounds</li> <li>The formula mass</li> <li>Solving problems with moles</li> <li>Avogadro's number</li> </ul>	<b>Prior knowledge:</b> This is the first introduction to these concepts. <b>More depth:</b> Ionic formulas (Sec 7.2, 8.1), ionic and metallic bonds (Sec 7.1), formula masses (Sec 8.4), stoichiometry (Sec 11.1) <b>Additional coverage:</b> Chemistry of the atmosphere (Sec 19.1)	NAC_Ch2_Sec2.ppt (Slides 18–35)	

Concepts	Concept Mapping	Lessons	Investigations
<b>Section 2.3 - Mixtures and Solutions</b> <ul style="list-style-type: none"> <li>Mixtures and solutions</li> <li>Concentration</li> </ul>	<b>Prior knowledge:</b> This is the first introduction to these concepts. <b>More depth:</b> Solutes, solvents, and water (Sec 9.1), concentration and solubility (Sec 9.2), gas–gas stoichiometry calculations (Sec 14.3), pressure and kinetic theory (Sec 14.1) <b>Additional coverage:</b> Chemistry of the oceans (Sec 19.2)	NAC_Ch2_Sec3.ppt (Slides 1–9)	NAC_Inv2C.ppt One in a Million
<ul style="list-style-type: none"> <li>Concentration</li> <li>Solubility</li> <li>Molarity</li> <li>Mixtures of gases</li> <li>Partial pressures</li> </ul>	<b>Prior knowledge:</b> This is the first introduction to these concepts. <b>More depth:</b> Solutes, solvents, and water (Sec 9.1), concentration and solubility (Sec 9.2), gas–gas stoichiometry calculations (Sec 14.3), pressure and kinetic theory (Sec 14.1) <b>Additional coverage:</b> Chemistry of the oceans (Sec 19.2)	NAC_Ch2_Sec3.ppt (Slides 10–43)	

This next table suggests the length of time needed (based on 50 minute class sessions and working with students working at grade level) and assessment using end-of-chapter problem set items

DAY	SECTION	ASSESSMENT
1-3	2.1	Practice: 1–8, 30–37, 53–58 Extension: 9–11, 38–41, 59–63
4-6	2.2	Practice: 12–16, 42, 64, 65 Extension: 17, 18, 43–46, 66, 67

7-9	2.3	Practice: 19–23, 47–49, 68–69 Extension: 52, 76, 79, 80
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A more traditional approach would consist of using the PowerPoint slides to drive 5-6 mini-lectures over as many online class “periods,” and assign selected items from the end-of-chapter problem sets. You can then use the additional days to show sections of the lab prep videos (online at TEACHER EDITION > RESOURCES . VIDEOS). As these are teacher resources, they contain answers to selected questions, but it is possible to give students a sense of what the lab is all about by showing the opening sections of videos, e.g., 0:00 - 2:50 min of video 2A; 00:00 - 1:50 min of video 2D, etc.).

If desired, you can skip the use of section PowerPoints by using the Podcasts (STUDENT EDITION > RESOURCES > VIDEOS) to introduce the new content. Students can view these offline for homework, but you might want to split the podcast over two viewings. You can use the free “class” time that follows (since you are not using the time to lead a PowerPoint driven lecture) to review and reinforce main points or to work out sample problems from the homework, look at labs in more detail, or assign and review student skill sheets (STUDENT EDITION > RESOURCES > DOCUMENTS).

Regardless of your overall approach, the podcasts can be assigned to back up your traditional lectures and the skill sheets can be used as supplemental practice.

STUDENT SHEET	TOPIC
2.1	The Mole - Basic Practice
2.2	Chemical Formula - Enhanced
2.3	Understanding Concentration - Enhanced
2.4	Calculating atoms, ions... - Enhanced

### LABS THAT CAN BE DONE AT HOME<sup>2</sup>

The following labs use items that may often be found in the home, in case a hands-on engagement or experiences is desired. You may wish to adapt the procedure to support home materials; for example, while graduated cylinders may not be found at home, there are containers that might be used to measure volume, even if the units use the Imperial, not metric, system.

LAB	TITLE
1B	Volume and Chemistry
2D	Density
6A-B	Periodic Table

<sup>2</sup> Safety eyewear should be used and students should perform these labs under adult supervision

7A, 7B	Lewis Structures and The Geometry of Molecules
8B	Naming Chemical Compounds
16A-B	Surface Tension and Surfactants; Measuring Viscosity
17A	Oil Spills
19B	Ocean Currents
20A	Half Life Experiment

### **BLACKLINE MASTER SET OF THE LIM**

The link below returns a pdf version of the Lab Investigation Manual (LIM) that can be shared with students. It contains blank spaces for students to write answers to questions and to fill in data tables. Please do not share beyond a password protected firewall.

<https://docs.google.com/document/d/1aYZwyDK671yU0Cg6uBO6lOXTnBCkJBcTNwh2Xi4AGSs/edit?usp=sharing>