


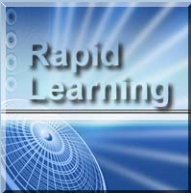
 **Rapid Learning Center**  
Chemistry :: Biology :: Physics :: Math 

Rapid Learning Center Presents ...

**Learn to Teach**  
**High School Chemistry** in 24 Hours




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 **Teaching High School Chemistry**

**HS Chemistry Rapid Learning Series**

Wayne Huang, PhD  
Kelly Deters, PhD  
Russell Dahl, PhD  
Elizabeth James, PhD

**Rapid Learning Center**  
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## Learning Objectives

**By completing this tutorial, you will learn about:**

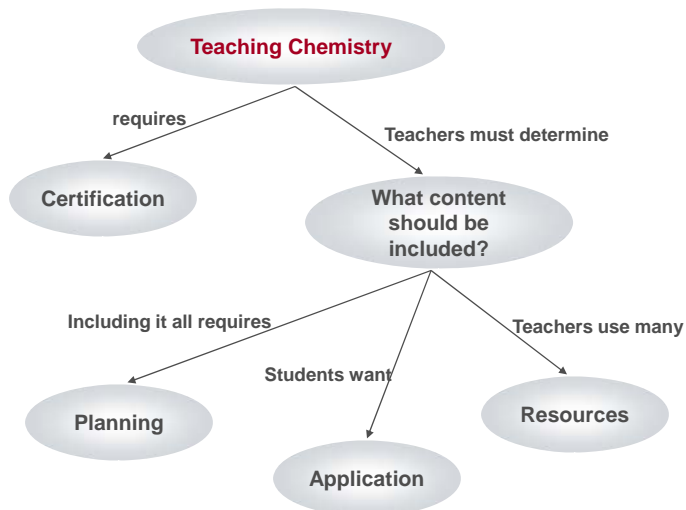


- How to become a chemistry teacher.
- How this tutorial series is set up.
- What content should be included in a HS Chemistry course.
- How to apply content to real life.
- How to plan.
- Where to find resources.

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## Concept Map



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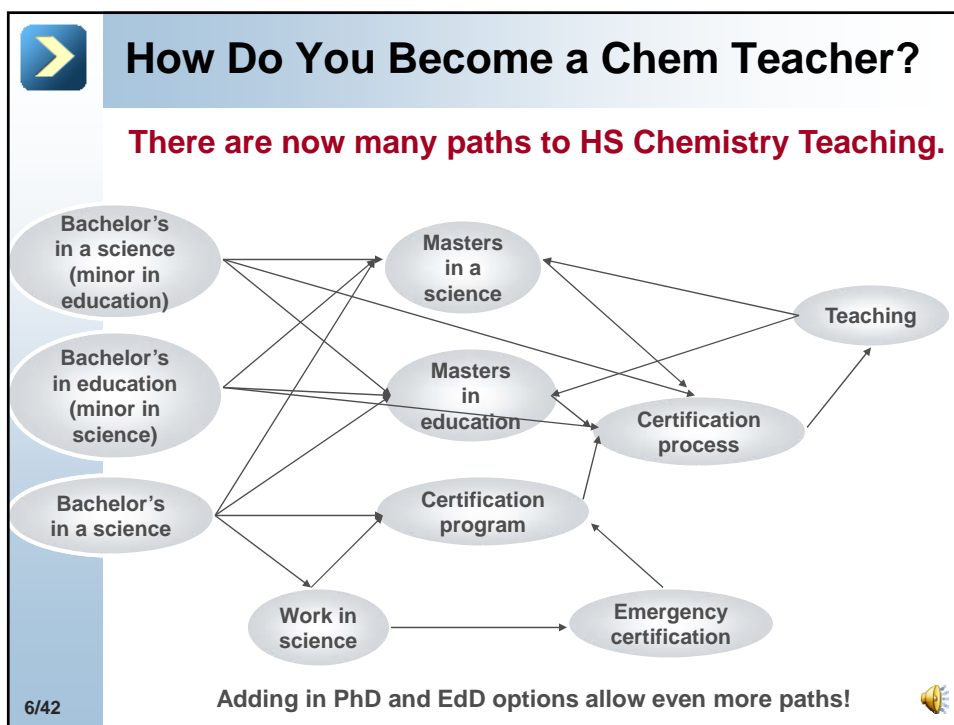




## Paths to Teaching High School Chemistry



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## The Certification Process

**It varies greatly from state to state. Visit your state's Board of Education website for information.**

Most allow emergency certification (with conditions that need to be met while you teach), provisional certification, the 1<sup>st</sup> time you certify and professional certification thereafter.

Many states now require standardized testing and/or background/fingerprint checks before certifying.

Some states require a major in chemistry, others require a minor and some only require a certain number of college hours in chemistry.



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## How is this Tutorial Series Set Up?



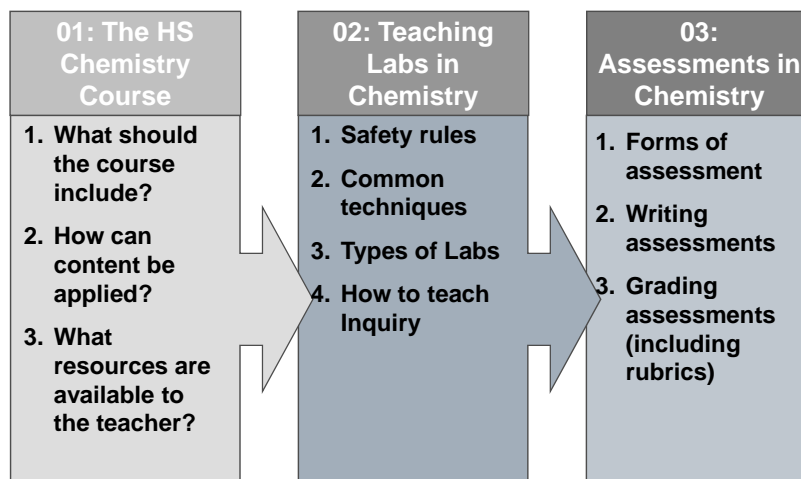
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## Tutorials 01 - 03

The first 3 are written specifically for teachers.



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## Tutorials 04 - 24


The rest of the series is written for the “students”—teaching content commonly covered in High School Chemistry

However, there are 3 areas in each of these tutorials that are for the teacher:


- 1 Teacher Intro Slide (brief overview of the content from an instructor’s point of view...coverage, stumbling blocks, etc.)
- 2 Teaching tips slides throughout the content section
- 3 Common Labs Slide (list of common labs addressing that content at the end of the tutorial)

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## What Content Should We Teach?




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## What to Teach?

**With so much content and a limited amount of time, how do you know what to teach?**

How do you balance depth and breadth? How do you prepare your students for college chemistry? How do you interest your students that aren't going on to college chemistry?



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## References

**The information in this section appears in two *Journal of Chemical Education* articles:**

### What Should We Teach in High School Chemistry?

Giving results of survey of 96 college professors nation-wide

### What Are We Teaching in High School Chemistry?

Giving results of survey of 571 HS chemistry teachers nation-wide

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## What Do College Professors Want?

**These 7 topics were rated by professors as their “top 5 must haves before coming to college chemistry” significantly more often than the other topics**

- 1 Basic skills (units, sig figures, graphing, etc.)
- 2 Moles
- 3 Dimensional Analysis
- 4 Stoichiometry
- 5 Naming/Writing formulas
- 6 Atomic structure
- 7 Balancing equations



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## What Else Did They Say?

Many survey respondents left comments concerning the “other skills” they want their students to have:

Skill	Covered in
Study skills	Tutorial 04
Problem-Solving skills	Tutorial 06
Lack of fear of studying chemistry	Tutorial 04 & 06
Appreciation for chemistry in everyday	Tutorial 01

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## What Topics are Teachers Teaching - 1

These topics are considered “appropriate” by more than 96% of the 571 HS Teachers and are being taught by a statistically similar percentage

Topic	Covered in
Basic Lab Skills	Tutorial 03
Basic skills (units, sig figs, etc.)	Tutorial 04
Dimensional Analysis	Tutorial 05
Classifying matter & changes	Tutorial 07 & 08
Writing/naming compounds	Tutorial 08 & 09
Moles	Tutorial 11
Types of reactions	Tutorial 12

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## What Topics are Teachers Teaching - 2

Topic	Covered in
Balancing Equations	Tutorial 13
Stoichiometry	Tutorial 14
Atomic structure (electron config)	Tutorial 15
Periodic table and periodicity	Tutorial 16
Types of bonding & properties	Tutorial 17
Gas Laws	Tutorial 19
Solutions & concentrations	Tutorial 20

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## What Don't They Have Time For?

These topics are considered “appropriate” by more than 90% of the 571 HS Teachers but are being taught by a significantly lower percentage of the teachers

Topic	Covered in
Scientific Process skills (lab design)	Tutorial 03
History of Atomic Theory	(not covered)
Lewis Dot Structures	Tutorial 18
Acid/Base (pH, strong/weak, titrations)	Tutorial 22

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## What Do They Feel is Not Necessary?

These topics were considered “appropriate” by a far fewer number of the 571 teachers

Topic	% feeling it's appropriate	Covered in
Equilibrium (qualitative approach)	71.1%	Tutorial 21
Thermodynamics (basic topics)	69.2%	Tutorial 23
Kinetics (qualitative approach)	68.0%	Tutorial 21
Acid/Base (complex problems)	42.9%	(not covered)
Equilibrium (quantitative)	41.0%	(not covered)
Kinetics (quantitative)	34.0%	(not covered)

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## Most Aren't Getting To All They Want!


Teachers rate an average of 20.8 topics as being appropriate to be taught (and more than 20% voted all 24 as being appropriate).

But teachers are only actually covering an average of 18.1 topics in their course!





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## How Can Content Be Applied?




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## Importance of Application

**Applying content to the students' lives is important!**

Application increase motivation and interest and decreases fear of studying chemistry and “when will we ever need to know this?”



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## “Applied” Doesn’t Mean “Lower”

**Applying concepts to the real-world does not mean a lower level curriculum!**

**Actually, it allows you to challenge the students even more because they’re interested and motivated!**



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## Textbooks with Application - 1

**There are several textbooks being developed with truly integration of application. All are geared towards first year high school chemistry and have slightly different focuses.**

**Chemistry in the Community (ChemCom)**

ACS produced, been in publication for many years

Focuses on environmental and industrial chemistry.

Published by WH Freeman

**Living by Chemistry**

Now available in preliminary editions

Units teach Alchemy, Smells, Weather, Toxin and Fire

Began as NSF funded project at UC-Berkeley

Published by KeyPress

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## Textbooks with Application - 2

### Active Chemistry

Interchangeable modules that have the students learn the skills needed to produce a product (such as a special effects movie).

Portions of the text are now available.

Published by It's About Time

### Chemistry You Need to Know

Textbook based on the research shown earlier in this tutorial.

Focuses on consumer products.

Published by Kendall/Hunt

**All 4 of these texts meet National Science Education Standards and include inquiry activities**

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## Application Projects

**Have your students write research papers or make presentations on a topic that interests them:**

- Fuel-cell cars
- Hair dyes
- Fireworks
- Luminol
- Glow in the dark algae
- Nuclear power plant



Or anything else they or you can imagine.

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## Reading Articles

**Have your students read articles and write about what they've learned. Places to find chemistry-containing articles:**

- Newspapers
- Chemical & Engineering News
  - ACS weekly magazine
  - <http://pubs.acs.org/cen/>
- ChemMatters
  - Magazine made just for high school chemistry students and teachers by ACS
  - Order annual subscriptions, compilation CD of 25 years, or see free sample articles at the website
  - [www.chemistry.org](http://www.chemistry.org) (search for ChemMatters)

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## Lesson Plans



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## Types of Lesson Plans

**There are as many types of lesson plans as there are teachers!**

Over the year, you'll find the right balance and format for you!

This section will show you what types of things you might include and how to organize them.

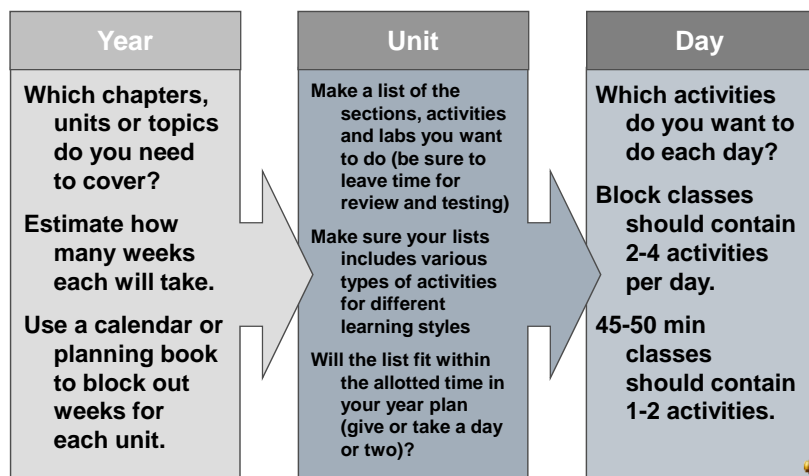


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## Long-Range & Short-Range Planning

**It's very important to have a rough outline of the year in the beginning to keep yourself on track...otherwise you'll get lost along the way!**



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## Activities

**What is meant by “activities” in the previous slide?  
What is an “activity”? Possibilities include:**

- Lecture/discussion
- Teacher demonstration & discussion
- Short hands-on learning
- Full lab (can take an entire block period by itself depending on the lab)
- Group work
- Individual work time
- Quiz
- Review game



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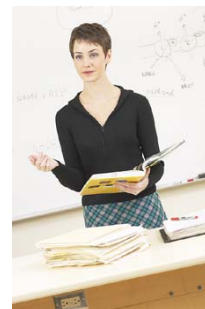
## Be a Little Flexible!

**Things happen! Plans will change!**

Snow days, assemblies, students not understanding and needing to go over it again! Your plans will inevitably need adjusting!

See what activities can be combined or dropped to make up time.

Extend the unit to include all the activities if you can't combine or drop any.



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## Writing Daily Lesson Plans

You may or may not want to include the following information (based on dept/building/district requirements and personal comfort levels)

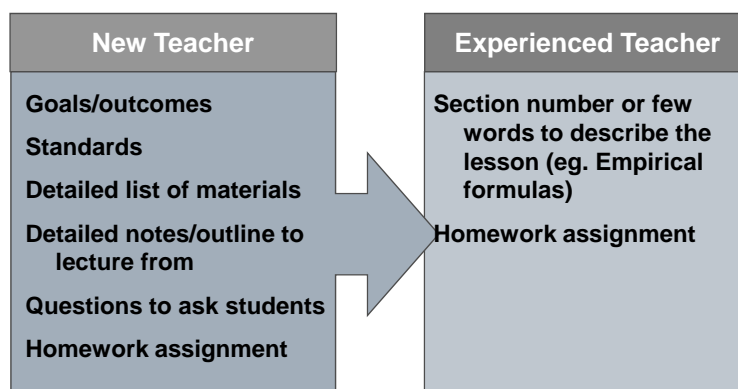
- Lesson goals & outcomes for the student
- Correlation to district/state/national standards
- Correlations to various learning styles (visual, auditory, kinesthetic, etc.)
- Time estimate for each activity
- Materials needed for each activity
- Outline for lecture/discussion/notes
- Homework to assign

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## Changing Over the Years

If your department/building/district allows, over the years, as you become more comfortable with the curriculum, you can shorten your lesson writing.



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## Organizing Your Plans

**There's no set method...find what works for you!**

Long-range planning can be done on a calendar with room to block out weeks or days with a unit title.

Short-range planning can be done in an official teacher planning book, a daily calendar book, or on a notepad or computer file where you just list top-to-bottom the days of the unit.



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## What Resources are Available for Teachers?



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## Professional Organizations

Many organizations can help chemistry teachers. Most also have ListServes that allow you to ask questions and network with other members!

- American Chemical Society & Division of Chemical Education
  - [www.divchemed.org](http://www.divchemed.org) and [www.acs.org](http://www.acs.org)
- National Science Teacher's Association
  - [www.nsta.org](http://www.nsta.org)
- State science teacher's associations
  - Search [www.nsta.org](http://www.nsta.org) or the internet for your state
- Some states have chemistry teacher's associations
  - Search [www.nsta.org](http://www.nsta.org) or the internet for your state

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## Chemistry Education Journals

Search the great resources available at the education journals.

- *The Journal of Chemical Education*
  - <http://jchemed.chem.wisc.edu>
  - They now have a portion of the site just for HS teachers (CLIC) and a reduced rate for access to full articles of interest for HS teachers
- *The Science Teacher*
  - <http://www.nsta.org/highschool#journal>
- *Chem13 News*
  - <http://www.chemistry.uwaterloo.ca/about/outreach/chem13news/index.html>

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## The Internet

**Search smart...go to pages that already have filter out many of the other sites!**

- Many organizations have resources that are free even to non-members with links to resources
  - [www.acs.org](http://www.acs.org), [www.nsta.org](http://www.nsta.org), your state science teacher's group
- Flinn Scientific has great safety information and links to some other resources
  - [www.flinnsci.com](http://www.flinnsci.com)

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## Learning Summary

There are **many resources** available to help chemistry teachers.


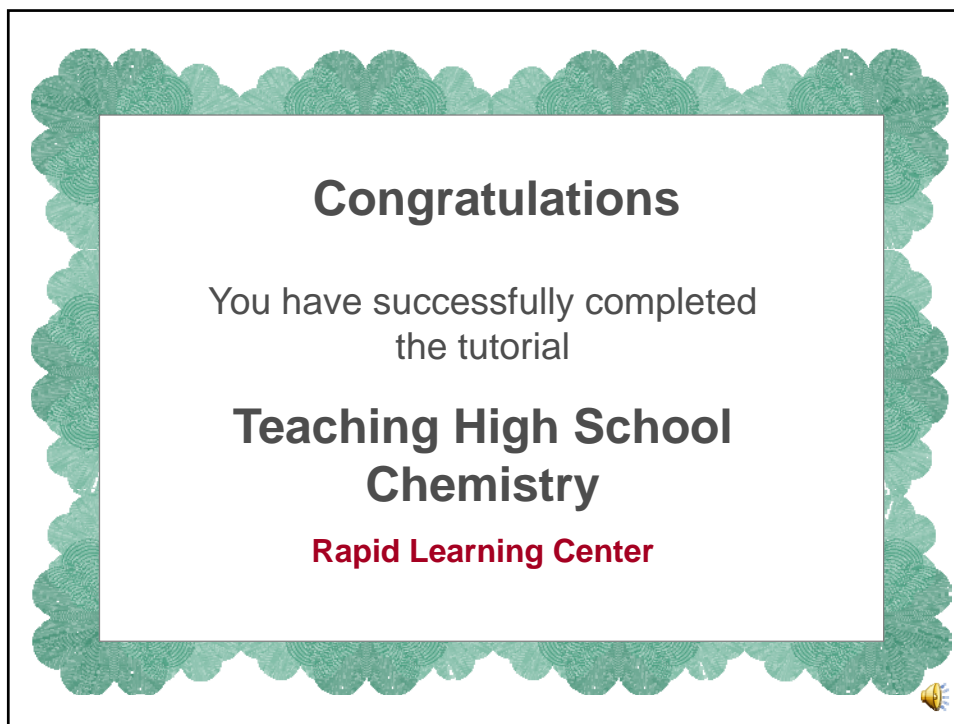
There are **many paths** to becoming a chemistry teacher.

**Research** can show what topics are most commonly taught in the course.


Long-range and short-range **planning** are important to getting through all that content.

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**What's Next ...**

Step 1: Concepts – Core Tutorial (Just Completed)  
→ Step 2: Practice – Interactive Problem Drill  
Step 3: Recap – Super Review Cheat Sheet

**Go for it!**



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