

# **Scaffolding a professional literature review**



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The goal of this presentation is to describe changes in our scaffolding of the literature review assignment. These changes improved our teaching, and helped students deliver a better final product.

# The literature review is important in biochemistry.

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[photos of covers of three journals dedicated to literature reviews: Annual Review of Biochemistry; Current Opinion in Chemical Biology; Nature Review Cancer]

## Functions of lit review:

- Introduces reader to new field, e.g. review history, development of seminal ideas.
- Helps reader keep up with the field.
- Allows the writer (typically a professional biochemist) to step back and determine the trends of the field.
- As part of a research article or grant proposal, the literature review helps justify the research.

We ask students to write a “mini-review”.

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**Mini-review (10-12 pages, double spaced):** For the mini-review, you will identify a **critical, well-defined theme** from the general topic you select and compose a comprehensive review of the **recent contributions** in that area.

Because of the importance of the literature review in biochemistry, we ask biochemistry students to write a “mini-review” on a topic of their own choosing. Like many professional reviews, the mini-review should be evaluative in nature (e.g., not just a summary), and focus on the recent research.

# Professionals differ from students.

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[photo of professional  
biochemist]



[photo of college  
sophomore]

Professional scientists are already experts and know the history of the field. Therefore, they can quickly identify trends.

Students will most likely choose a topic they know little about.

## How to guide novices during abbreviated course?

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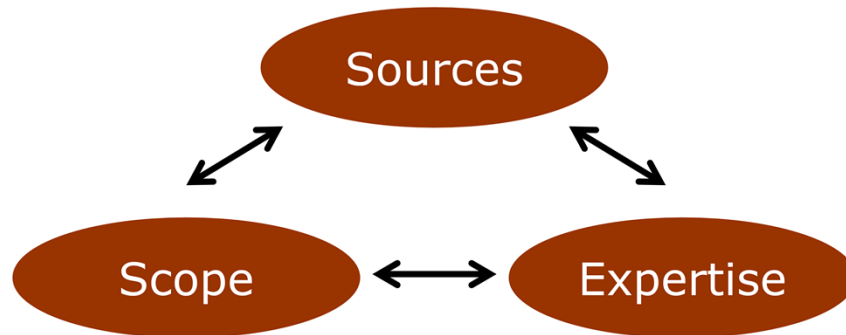
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Week 1	Lecture and models
4	Outline
6	First draft
6/7	Individual conference
9	Final draft

Another challenge for students was to write a literature review in 9 weeks. We scaffolded the assignment to provide feedback at numerous stages: outline, first draft, individual conference (to discuss the first draft).

## Students are challenged by certain lit review skills.

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Sources: Extract & synthesize information from sources.

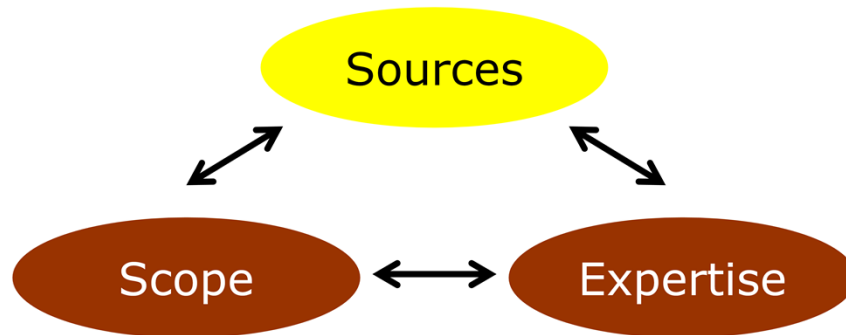
Scope: Define scope, both thematic and temporal.

Expertise: Develop & demonstrate expertise/mastery of topic.

Writing a literature review is an iterative, not linear, process.

Students are challenged by certain lit review skills.

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We first describe changes in Sources.

## We first addressed identifying and working with sources.

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	'08	'09	'10	'11	'12	'13	'14
Lecture & model							
Outline							
First draft							
Indiv conference							
Final draft							

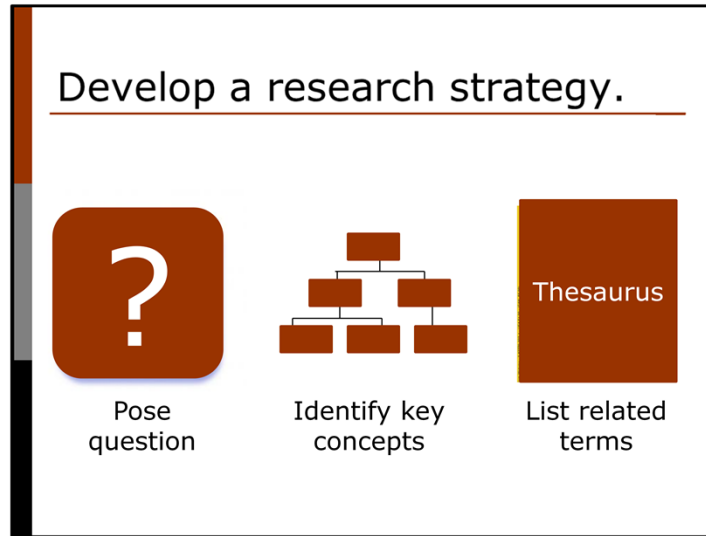
The row headings are taken from our scaffolding of the assignment (see slide 5); the column headings are the years in which challenges were identified or addressed.

We first identified challenges with using sources early in the course, and addressed sources the next year at the lecture.



# Students often complained of not finding enough sources.

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Students often had trouble finding appropriate sources, so in the lecture (sample slide above), we described the importance of having a research strategy. We stressed the importance of flexibility, and the insufficiency of one round of searches.

# Model review helped explain synthesis.

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## Grids can help you make claims that synthesize.

Source	Methods	Results
Gorre <i>et al.</i> , 2001	Biochemical analysis of clinical material	Resistance due to T315I in BCR-ABL or gene amplification
Roumiantsev <i>et al.</i> , 2002	Biochemical analysis of clinical material	Resistance due to BCR-ABL mutations at Y253
Azam <i>et al.</i> , 2003	In vitro screen of mutagenized BCR-ABL	New mutations reveal novel allosteric mechanism

*Claim: Imatinib-resistant mutations have been found clinically and in vitro.*

Students also tended to write lists of summaries in their first drafts, despite having a model professional article (Weisberg *et al.* *Nat Rev Cancer* 7: 345 (2007)) that synthesized information. So, we used the model article to draw up an evidence table (sample slide above), to help students identify patterns and points of intersection.

## Model professional review was not sufficient.

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	'08	'09	'10	'11	'12	'13	'14
Lecture & model							
Outline							
First draft							
Indiv conference							
Final draft							

In 2010 and 2014, we added models for other stages of the writing process.

# Outlines help, but only with a particular format.

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## II. Imatinib resistance

- a. This section will describe both direct and indirect ways that BCR-ABL can develop resistance to imatinib.
- b. Cowan-Jacob *et al.* (2004) describe mutations around the imatinib binding site that directly lower binding through steric hindrance or preventing favorable interactions between the kinase and inhibitor.
- c. Roumiantsev *et al.* (2002) and Cowan-Jacob *et al.* (2007) describe mutants that confer resistance through an indirect mechanism. In particular, these mutations destabilize the inactive conformation of the ABL kinase, to which imatinib normally binds.
- d. This section will include a table that lists the known mutations, their molecular mechanisms of resistance, and their oncogenic potential.

**Comment [LAR4]:** The relationship of your subheadings to your overall theme should be clear. Each subsection should include 2 or more references.

**Comment [LAR5]:** Clear statement of purpose will help frame the coming information for the reader and will help you to focus your explanation.

**Comment [LAR6]:** Cite your sources for support, and use the correct format for citations.

**Comment [LAR7]:** Your minireview should have 1-4 figures. Describing your figures in your outline would enable your CI-M instructor to provide advice on the appropriateness of the figure's location and content.

Students received feedback on the outlines, but the outlines came in different formats: most lacked the detail needed for constructive feedback. Therefore, we designed an outline (again, based on the model published review the students read) to demonstrate the level of desired detail. The outline was also annotated to explain the importance of informative subheadings, citations, and illustrations.

## Student-written model demonstrates use of sources.

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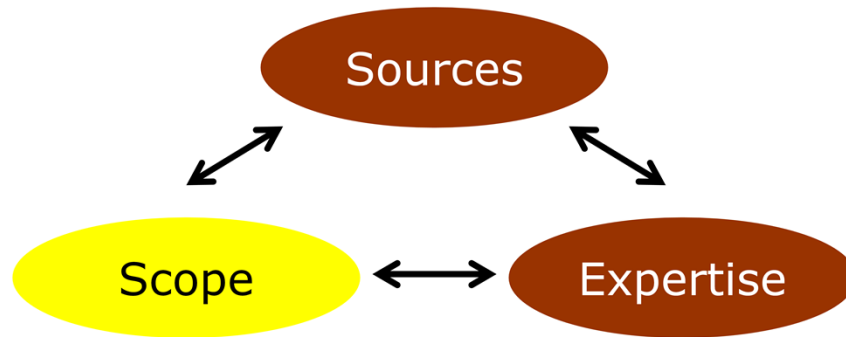
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- Paraphrasing
  - [Quantum dots (QDs)] have been found to remain active and visible in vivo for up to two months with no ill effects on the subject<sup>24</sup>.
- Citing article multiple times
  - QDs in live animals have triggered defensive mechanisms by which QDs are taken up by the liver, spleen, and lymphatic system where they remain for long periods<sup>24</sup>.

Students were also given a well-written literature review by a former student. The review was annotated to highlight how the student paraphrased, i.e. did not summarize the whole article. Because the student only included certain details in one part of the review, other details could be mentioned elsewhere in the review.

Students are challenged by certain lit review skills.

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The next thing we identified as a challenge was the scope of the review – in particular, the temporal scope.

## Assignment description hints at scope.

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[Your review should include] 10 to 15 references, including at least 10 that are primary research reports. Reports should focus on recent literature, so at least 8 references should be from within the past 4 years.

The only place that scope was explicitly explained was in the assignment description. Four years was arbitrarily chosen to emphasize the timeliness of the review; this time period is appropriate for biochemistry, a field where developments occur at a fast pace.

## Conferences belatedly helped students define scope.

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	'08	'09	'10	'11	'12	'13	'14
Lecture & model					■		
Outline							
First draft							
Indiv conference				■			
Final draft							

Despite the assignment description and outlines, the first drafts tended to dwell on much older findings. The need to reframe the assignment was clear by the individual conferences in 2011. Therefore, we tried to address it in the lecture of the subsequent year.



## Reframing the review in lecture emphasized scope.

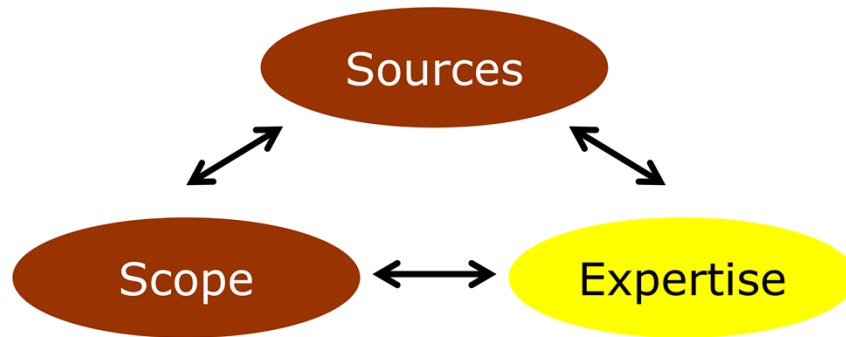
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What are the field's exciting developments in the past 4 years?

We included a new slide in the lecture. Students could view the literature review as a response to the above question.

Students are challenged by certain lit review skills.

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## First drafts showed emergence of expertise – in history.

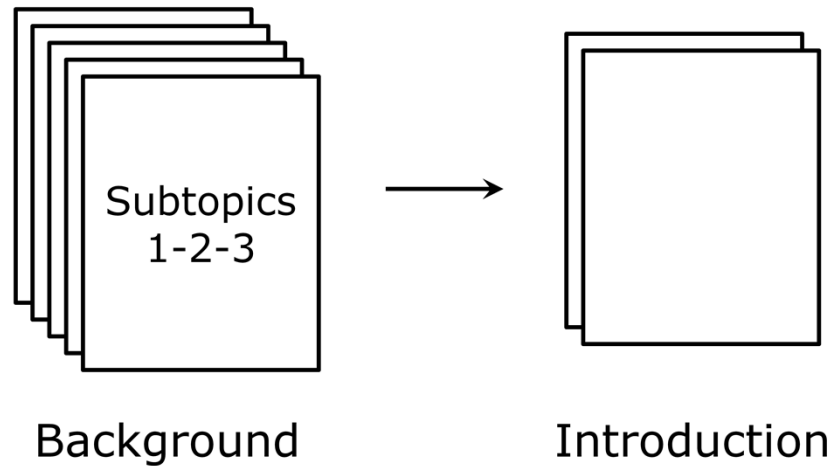
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	'08	'09	'10	'11	'12	'13	'14
Lecture & model							
Outline							■
First draft						■	
Indiv conference							
Final draft							

We still were challenged with the issue of scope in the first draft, but the compressed schedule did not leave us with many stages to address it. So, we tried a new strategy: replacing the outline with a new assignment.

## Background summary helped develop expertise earlier.

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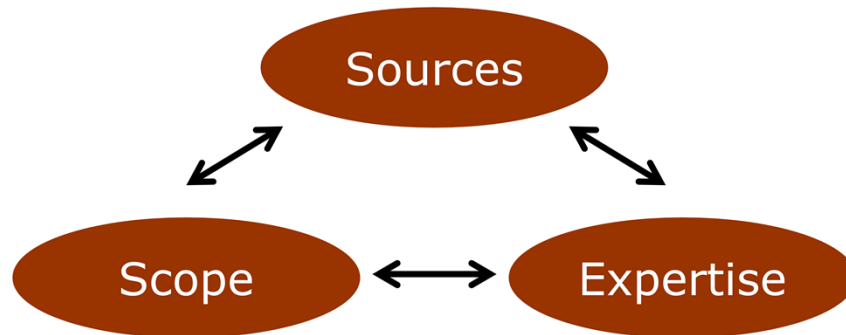


Instead of the outline, students are now asked to write a 3-5 page summary of the background of the field. The rationale is that students were going to write one anyway, perhaps as a way to process what they learned. We also reasoned that writing the history would allow students to identify more easily the more “recent” developments for their literature review.

This summary would not go to waste, as the students were expected to transform the summary into the 1-2 page Introduction of their literature review. We believe that condensing the material also helped students master the topic.

## Modifying assignments hastened iterative process.

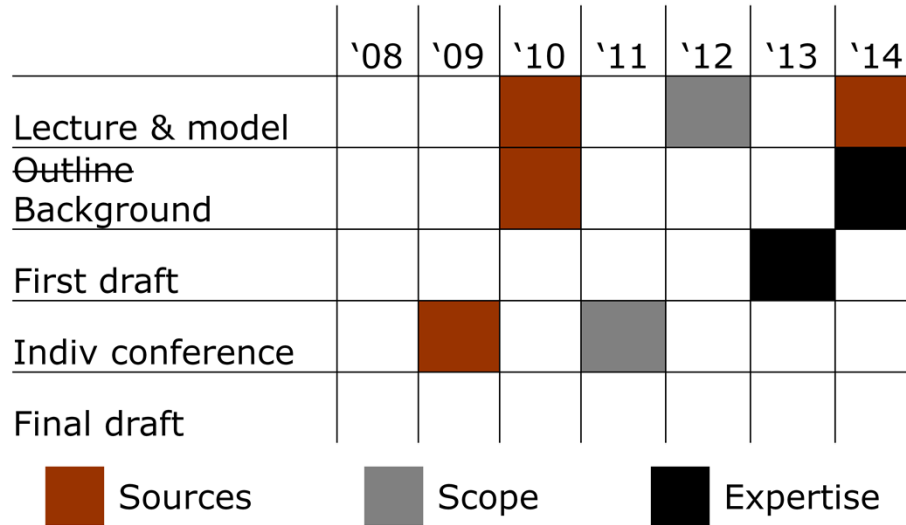
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Our identification of challenges helped us address those issues earlier, and perhaps hasten the iterative process needed to produce a literature review.

## Schedule forced us to identify and address challenges.

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Future studies can help determine which stage is most effective.