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.
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.
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.
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.
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.

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.
We first describe changes in Sources.
We first addressed identifying and working with sources.

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

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Student-written model demonstrates use of sources.

- **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.\(^\text{24}\)

- **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.\(^\text{24}\)
The next thing we identified as a challenge was the scope of the review – in particular, the temporal scope.
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.

Assignment description hints at scope.

[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.
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.
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.
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.

First drafts showed emergence of expertise – in history.

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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.
Our identification of challenges helped us address those issues earlier, and perhaps hasten the iterative process needed to produce a literature review.
Future studies can help determine which stage is most effective.