Using 'eDrops' *(electronic, Directed, reflective opportunities)* to Guide Students as They Engage the Primary Literature

Glen A. Livesay
Samuel F. Hulbert Endowed Professor of Biomedical Engineering
Department of Applied Biology and Biomedical Engineering, Rose-Hulman Institute of Technology, Terre Haute, IN 47803

Abstract

Developing the ability work confidently with the primary literature – to read, review, and critique, as well as extract relevant information – is a critical skill. With this innovation, I have tried to streamline the development of this skill using something called 'eDrops' *(electronic, Directed reflective opportunities)*. eDrops are intended to provide scaffolding for the students and support their development in a structured, guided environment as they read real abstracts/papers. By placing embedded 'notes' or 'questions' in electronic versions of the abstracts/articles that the students 'uncover' as they read, we can help them to more quickly develop critical thinking skills.

This innovation is largely 'reflective/self-directed' and therefore most directly matches the highlighted pedagogical topic of 'Active and Self-Directed Learning: Inside the classroom and/or in preparation for class'

Introduction and Objectives

The objective/educational outcome of this innovation is to assist students as they work to make the transition from someone who believes something because it in an abstract (or article) to an 'informed' reader of the primary literature. By an 'informed' reader, this means someone who can bring to bear their knowledge from other courses and/or experiences to gauge the reasonableness of the research they are reading, and to develop targeted questions. 'eDrops' are intended to provide scaffolding for the students and support their development in a structured, guided environment, at least as they begin reviewing the primary literature.

One of the major challenges students face as they begin to read the primary literature is a complete lack of experience . . . not surprising since they are just learning. The big question is: How can we help them to develop as informed readers/evaluators of the literature?

Since I can't be looking over their shoulder to point out interesting questions/ notes as they read - I tried the next best thing; creating .pdfs of current research abstracts in which I had embedded pertinent questions at specific points in the abstract/ article.

Introduction *(cont.)*

In essence, certain areas of the abstract (or article) are highlighted in such a way (using field tools in Acrobat) that when a student is reading they can roll the mouse over a highlighted area and see a specific, targeted question pertaining to that area of the abstract (Figure 1). This enables me to sort of 'ride shotgun' with them as the students first began reading/critiquing the primary literature. Working from current research abstracts, I read them, make notes where I mentally 'catch' on a particular method, technique, assumption, *etc.* and then highlight the abstracts for things that should engender questions based on the students present level of knowledge in biomechanics. For example, how fast was the testing done? Does the specimen preparation affect the results? If so, how? Etc. (Figure 2)?

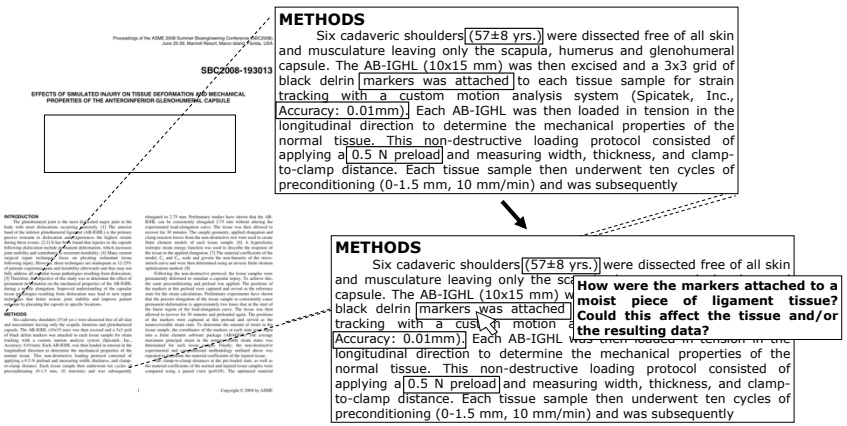

Figure 1. An illustration of a research abstract that has been modified with eDrops. The exploded view of the methods section shows the gray boxes surrounding specific items of note which are the eDrops, and the lower view shows what would appear to the student (as an example) if they mouse over (the black arrow) the eDrop 'markers was attached'.

Developmental History

The eDrops approach of 'annotated' abstracts/articles was something I started by hand a couple of years ago, by placing asterisks in abstracts/articles I asked them to read to remind students that 'something was going on here'. Transitioning to an electronic form, this has been utilized in my Junior-level Biomechanics course the last two years (and in one graduate course).

Learning Activities/Materials

Thus far, I have developed 'eDrops' for roughly 25 abstracts and 10 journal articles for student use in the introductory biomechanics course and an advanced biomechanics elective.

Execution

It is possible to employ the eDrops approach anytime you ask students to read an abstract or article. Typically, it would be part of a homework assignment, so students have time to read the abstract and to interact with your eDrops (embedded questions/ideas) prior to discussions in class.

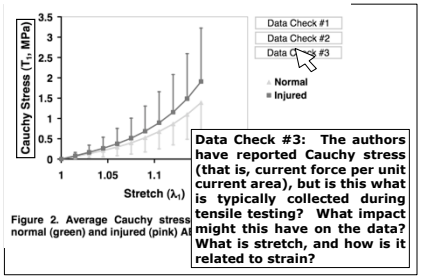

Figure 2. An illustration of an alternative eDrop style: In this case, a guiding question appears when the students rolls the mouse over (the black arrow) 'Data Check #3', and a red box highlights a specific point of interest in the abstract (the red box around the label for the vertical axis).

Execution *(cont.)*

Ideally, one would start with detailed, guided questions (as eDrops) early on, transitioning to less directed eDrops as the students develop some experience, then moving to highlighted areas (but no eDrops) so the student knows there's something here, but they must work on it). Finally, one could have the students develop their own annotated abstracts (meaning make their own eDrops).

Major Issues to Resolve

First of all, while I have anecdotal data on the effectiveness of eDrops, some formal assessment is needed to determine whether the eDrops are benefiting the students (or some subset of students) in terms of their development as 'informed' readers . . . how quickly, and how deeply are they learning?

Secondly, the process of creating the eDrops in the .pdf of the abstract is still a little clunky and time-consuming, but workable. It looks like the creation of the eDrops might be made much easier through the use of the Apple scripting language and .pdf manipulation.

Discussion

Thus far, the 'eDrops' seem to have worked in terms of helping students develop more quickly into 'informed' readers of the primary literature. Using eDrops to provide scaffolding for them as they interact with the primary literature, appears to help students produce much better critiques than in the past, and also to begin to recognize (earlier) that they know enough to ask good questions more quickly than previously. Some students reported that they would have preferred a 'pay as you go' type model . . . in which they had to 'pay' (in some form) for the 'eDrops', but benefit if they happened to not need them when reading. Development is ongoing!

Acknowledgments

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