A rubric-based grading app for iPads

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Abstract

While there are numerous classroom management and instructional apps available on the touch-based devices such as Apple's iPad, there are limited alternatives that offer comprehensive grading functionality. The few apps that do exist, lack the features necessary for effectively grading technical reports or are poorly designed to take advantage of the touch gestures. This paper describes the inception, development, and key design features of an iPad app, evaluA+, that facilitates rubric-based grading of both written and oral assignments. evaluA+ is specifically targeted for grading essays, technical reports, and oral presentations by displaying the grading rubric alongside the student submissions. Apart from grading, the app allows creation of tailored grading rubrics, direct distribution of the rubric to the students, wireless synchronization of assignment documents, and direct dissemination of evaluated material for feedback. Additionally, the app can function without an internet connection, providing instructors the ability to remotely grade assignments. In essence, the app eliminates the need to rely on hard copies of documents for assessment purposes and affords true mobility for the instructors. The paper elaborates on the key interface components that provide an integrated and a more natural alternative for evaluation, at the same time serving as an assignment management tool. As a result, the utility of the app is not limited to science and engineering fields but will aid evaluation of any open-ended assignment. We also report current developmental efforts and future evolution of the app. Overall, evaluA+ presents itself as a next generation of educational tool that will be indispensable for instructors seeking effective and efficient grading alternatives.

Introduction

In an effort to facilitate common grading responsibilities of teachers, several computer based solutions exist that attempt to digitise evaluation of student assignments. Some solutions allow grading of digital copies of reports and essays while many enable instructors to electronically manage overall class performance.[1-5] Often these solutions require multiple applications and reliance on a laptop which in many cases is not the most convenient of options considering their size. In addition, reviewing on computer monitors can present its own challenges in terms of visual discomforts. With the advent of post-PC devices, such as Apple's iPad, there is an increased interest in developing educational apps that provide a more comprehensive solution.[6] The added benefits of such an approach are that these devices are highly portable and provide a more natural form of interaction with the content using touch-based displays.

While there are mobile apps that help generate lecture outlines, presentation slides and notes for the preparatory stages of instructional duties, there are limited apps that assist with assessment. The limitation is partly due to the added requirements for features that the app needs to posses for effective evaluation of assignments. For instance, the app must feature the ability to accept submission of digital copies of assignments, store the submissions for assessment offline, allow the user to review and grade the student submissions followed by returning the graded

assignments along with individualized feedback. Considering mobile apps do not inherently rely on file systems as traditional operating systems do, an entirely new interface for reviewing student submissions needs to be envisioned. While these features can present challenges to the design of an app, tablets can leverage their displays for superior reviewing capabilities.

This paper describes the development philosophy and design of an app called evaluA+ (pronounced, 'evaluate'). evaluA+ streamlines the evaluation responsibilities of instructors and provides an intuitive interface for effective grading of technical reports, essays and presentations. In essence, evaluA+ eliminates the need to solicit hard copies of assignments from students and forces instructors to develop grading rubrics that have already been shown to be an effective assessment tool. The paper will elaborate on the key features of the app and document developmental milestones. The app is currently under development and will be available shortly for download from iTunes App Store for the iPad. We expect to receive critical feedback from educators to inform future development and direction for evaluA+. Currently in its first iteration, evaluA+ promises to become an important instructional technology as more features are added.

Background and Inception

The inspiration for the app came while grading technical reports prepared by students for their term projects at the end of Fall 2011 term. The students were provided grading rubrics prior to the assignment submission date and asked to submit a PDF version of their final report via email - all in the effort to eliminate hard copies for assessment purposes. During the evaluation stage of such an assignment, an instructor would typically display the rubrics besides the student report while reviewing and grading. An example of this process can be seen in the desktop screenshot provided in Fig. 1. This particular approach uses annotation features of a PDF viewer to grade the report and provide feedback. Figure 2 provides an example of a grading rubric that is more detailed for evaluating a different written assignment. In the end, both the scored rubric and the assignment with instructor feedback can be shared with the student via email or as a hard copy.

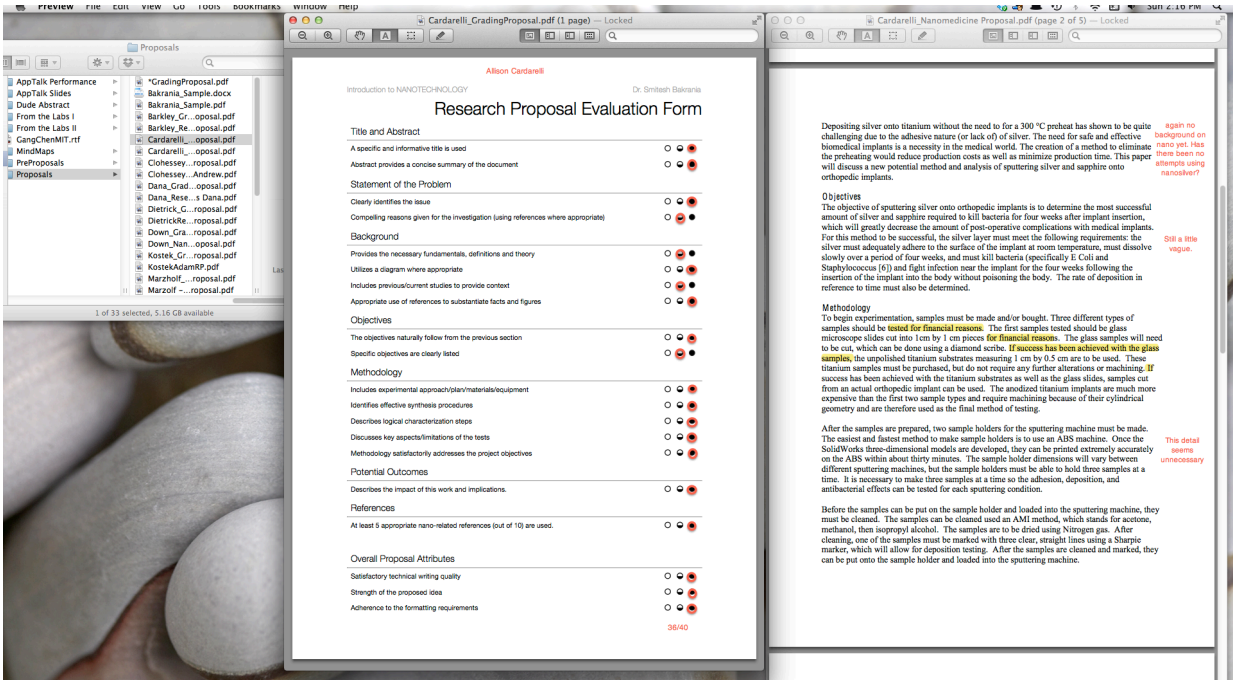

Figure 1. A screenshot of a typical digital grading approach. The rubric is displayed besides the student submitted report for grading. PDF annotation tool is used to grade and provide feedback.

Elements/ Criteria	Performance Level Descriptors					
	Score	**Unacceptable**	**Needs Improvement**	**Acceptable**	**Meets Expectations**	**Exceptional**
On time	**/4**	(0 points) Submitted more than 2 days late	(1 point) Submitted 1-2 days late	(2 points) Submitted > 2 hours but less than one day late	(3 points) Submitted within 2 hours of midnight on due date	(4 points) Submitted on time or early
Required Components	**/4**	(1 point) ≥ 4 of 7 components missing/ incomplete, &/or not appropriate for intended purpose	(2 points) 3 of 7 components missing/incomplete, and/or not appropriate for intended purpose	(3 points) 2 of 7 components missing/incomplete &/or not appropriate for intended purpose	(3.5 points) 1 of 7 components missing or incomplete, or not appropriate for intended purpose	(4 points) All seven required components present, complete and appropriate
Appearance	**/4**	(2 points) Final product is unappealing and/or looks unprofessional and/or flows poorly-difficult to navigate	(2.5 points) Final product is plain or cluttered, lacks professionalism, and/or is somewhat disjointed	(3 points) Final product is somewhat appealing, looks fairly professional, and flows enough to navigate fairly easily	(3.5 points) Final product is appealing, looks professional and is easy to navigate	(4 points) Final product (layout, images, text boxes, table) is attractive, looks professional and flows smoothly- easy to navigate
Coherence	**/4**	(2 points) Text layout is messy, inconsistent or distracting, and/or does not accomplish its purpose as stated in drop box, and/or purpose not stated.	(2.5 points) Text is inconsistent and only partly accomplishes purpose as stated in drop box &/or is not appropriate for audience	(3 points) Text is neat/justified; adequately accomplishes is purpose as stated in drop box and is appropriate for audience	(3.5 points) Text is laid out effectively; text accomplishes is purpose as stated in drop box and is appropriate for audience	(4 points) Text is justified and laid out effectively; fully accomplishes is purpose as stated in drop box and is effective for audience
Spelling & Grammar	**/4**	(2 points) Spelling and Grammar are poor (~3 or more errors in each). Tone of text is unprofessional and ineffective for audience	(2.5 points) Spelling &/or Grammar weak (≥2 errors of each); &/or lacks professional tone or not adequate for audience	(3 points) Spelling and Grammar are adequate (~2 errors of each). Tone is adequate for audience	(3.5 points) Spelling and Grammar are adequate (1-2 errors total). Tone of text is professional and/or adequate for audience	(4 points) Spelling and Grammar are excellent. Tone of text is professional and effective for audience
Total/20		*Comments:*				

Figure 2. A sample rubric for grading a newsletter writing assignment. Courtesy of Peter Rattigan, at the Department of Health & Exercise Science, Rowan University.

While the computer-based approach for paperless grading is sufficient, the necessity for manual score tracking and the fact that instructors are confined to their desks warrant an alternative approach. Specifically, an approach that automates the score tracking and augments the reviewing capabilities. Therefore, a mobile app for tablet-PCs was envisioned to provide the same layout presented in Fig. 1, but with interactive display that tracks student performance while reviewing on a handheld display. Considering our previous experience with Apple's iOS app development with the Pikme app[7], we began conceptualizing an evaluation app for Apple's iPad. We also wanted to bring the same user-friendly features available on Pikme to the new app, recognizing tremendous success of Pikme on the iPhone. Pikme has been downloaded over 3000 times since it was first introduced.

Design and Features

During the developmental stages of the app it was established that the app will be designed around rubric-based grading. In other words, rather than allowing instructors to simply assign a grade or a score to the submitted assignment, instructors must develop a grading rubric *before* beginning to evaluate. As a result, this decision defined the overall functionality of evaluA+ and at the same time sets it apart from other similar ventures. Apps such as Essay Grader[8], Desire2Learn[9], SpeedGrader[10], and HighMarks[11] provide the ability to assign scores or grades and feedback to the assignments but do not require or have the functionality to perform rubric-based grading. Rubic-based grading is becoming increasingly common in science and engineering fields because of several well-established advantages that it offers.[12-14] Therefore, evaluA+ is designed with grading rubrics as the critical design feature.

Upon launching the app the user is greeted with a home page that describes the basic functions. To begin the user creates an assignment binder with the class name and the assignment title, followed by the grading rubrics creation step. The app allows users to develop simple checklist-type grading rubric or create more detailed rubrics (such as the one shown in Fig. 2). Figure 3 provides a screenshot of the rubric creation screen on evaluA+, with a list of existing assignment binders to the left. Rubric criteria details include a short title, maximum assigned points and a detailed description of performance levels. The user can identify if the rubric is created for grading a written assignment or an oral assignment by switching to the presentation mode. Once the rubric is created, the user can save the grading rubric and share it with the students prior to the assignment due date. Tapping the 'Share Rubric' button (top-right of the screen in Fig. 3) generates a PDF of the rubric with performance levels that serves as a useful guide for the students while preparing their assignment.

Figure 3. Rubric creation view. The view allows creation of the rubric criteria and the point breakdown. The rubric can be exported as a PDF for sharing purposes.

To facilitate wireless transfer of documents, evaluA+ requires a Dropbox account that stores the student submitted documents. Dropbox.com offers a free cloud storage account that can be accessed on computers and mobile devices. For convenience, the instructor can ask the students to submit their assignments as PDFs with file names that identify the students, e.g. 'LastnameFirstname.PDF'. The instructor places these files in a dedicated assignment folder for evaluA+ on Dropbox. Once the assignments have been collected and placed in the dedicated Dropbox folder the user launches the app to proceed with evaluation.

Once the rubric is created and the assignments stored on a Dropbox folder, the user must link the Dropbox account to evaluA+. This will allow access to the submitted assignments. As the specific folder is selected, the instructor can view all the student submissions as a list as shown in Fig. 4. evaluA+ registers the selected folder and links the assignment rubric for grading. At this point, the user can download all the assignment submissions and store them locally for offline use. This can be a useful feature when there is no WiFi access, for instance while traveling.

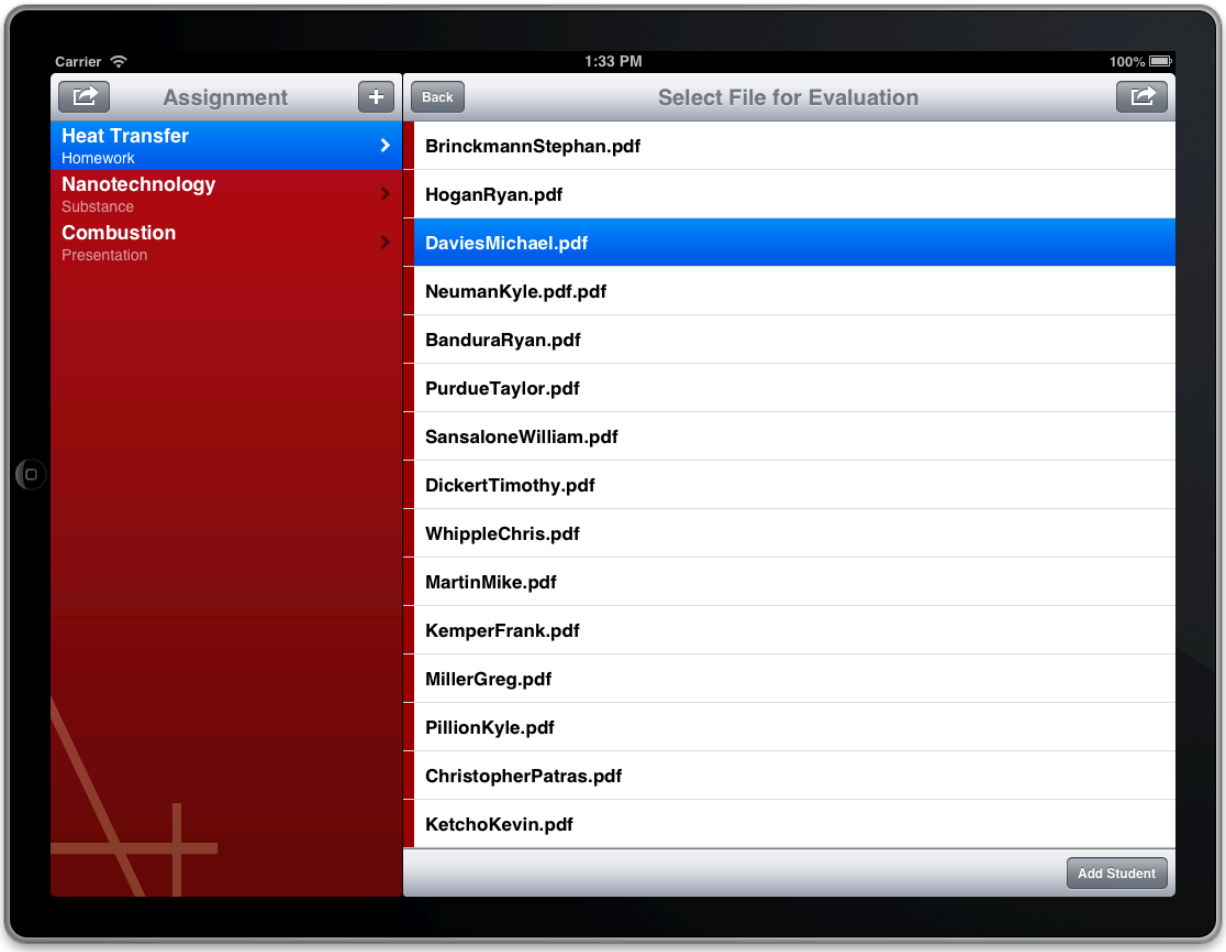

Figure 4. Submitted assignments list view. Selecting an assignment takes the user to the evaluation view.

At the grading stage, the user must select the individual assignments which activates the evaluation view. The evaluation view shown in Fig. 5 presents the selected rubric on the left and the individual assignment to the right. The evaluator can change the criterion scores by tapping on the "+" or "-" buttons. Tapping on any criterion reveals the detailed description for point assignment. Double tapping on the total points area at the bottom toggles between the maximum and minimum points to save time while scoring. Once the evaluation is complete, the user taps on the 'evaluation complete' button at the bottom to record the score and move to the next student. The scores are then displayed on the assignment list.

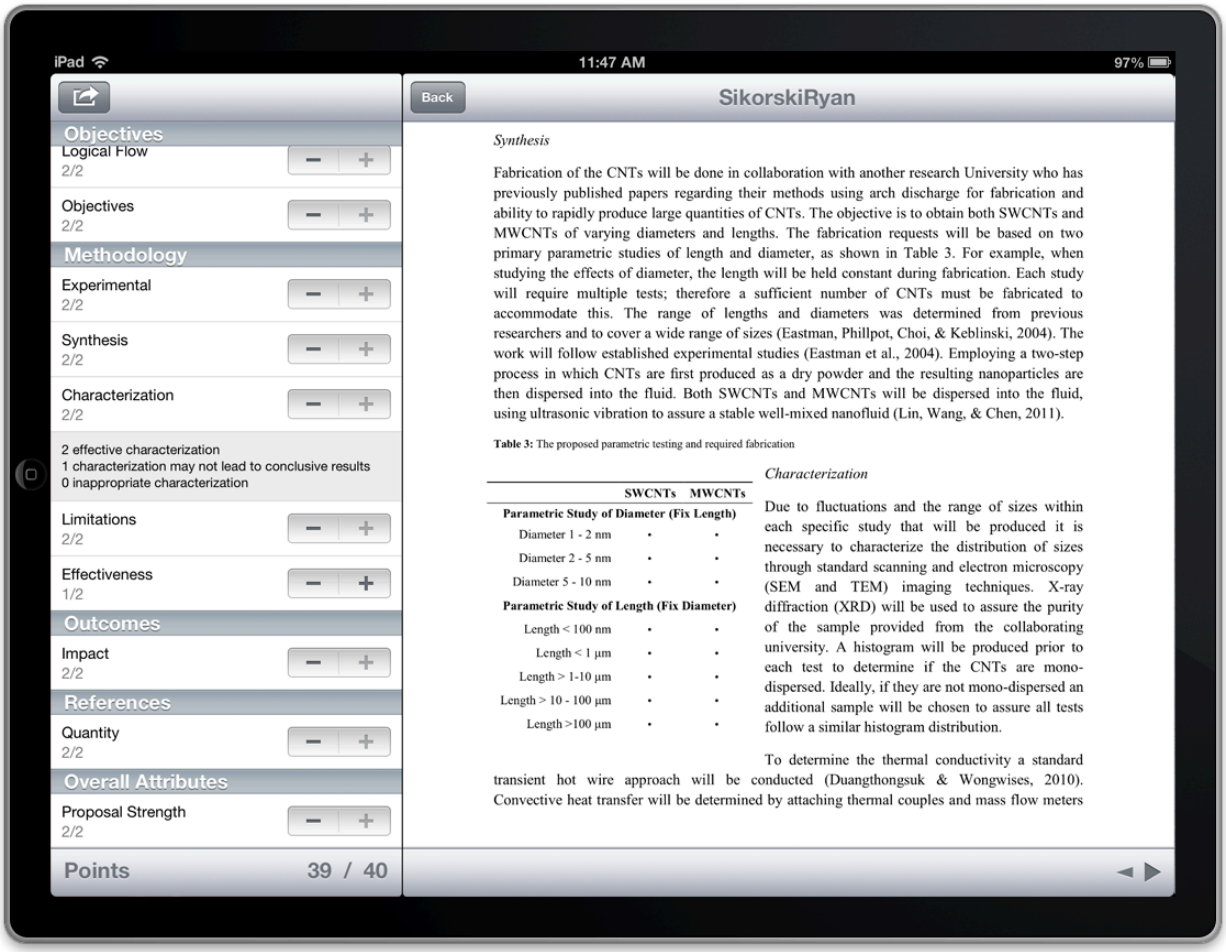

Figure 5. Evaluation view displaying grading rubric and the individual assignment side-by-side.

While on the assignment list view, the user can share the scores by emailing a CSV file of the student performance to user defined email. The CSV file can be easily imported into a spreadsheet program for recording the scores. The share function also places individual evaluation sheets as PDF files in a dedicated folder whose title ends with '.A+' on the Dropbox account.

As mentioned earlier, the same app can be used to evaluate student presentations. The procedure is similar in that it also requires the rubrics to be generated *before* evaluation however it does not require an assignment file. Once indicated within the rubric creation view by switching on the presentation mode, the user enters student names to begin evaluating. And instead of displaying PDF along with the rubric, the evaluation view displays the grading rubric so that the user can simply grade the student as he/she presents.

For testing purposes, evaluA+ was used to grade multiple written assignments with a class size of over 20 students. The app performed satisfactorily even under the current developmental

stages. Even though several minor adjustments were identified, evaluA+'s overall functionality proved highly effective for grading written assignments.

Future Developments

While the critical components of evaluA+ have been integrated, there are a number of useful features that will augment the future functionality of the app. These features leverage the touch-based interface and provide a more complete solution to the evaluation of written and oral reports on the iPad. Both these features are targeted to provide individualized and detailed feedback to the students.

Evaluator Feedback

In addition to sharing the graded scores, evaluators often have the need to share specific comments to the students. These evaluator comments may include thoughts for future improvements, highlighting gross mistakes or misconceptions, emphasis on components that strengthened the assignment, etc. Therefore, the next version of the app will include a comment area within the evaluation view to add individualized comments which will become part of an evaluation report. In addition, evaluators may have common items to share between several students within a class. Therefore, the user can create a library of comments to quickly add key points as part of their comments. These features will afford efficiency in grading particularly for larger classes.

Annotation

An important feature that is clearly lacking is annotation directly on the submitted assignments. As instructors we often prefer hard copies of reports for grading to provide content-specific comments. The current version of the app does not support direct annotation on the PDFs like some others apps do.[15] This feature is under development and will be available in the next version of the app. Combined with the textual evaluator comments, annotated assignment submissions will enable rich instructor feedback to the students that is automatically stored for posterity.

Conclusion

From our standpoint, this is the first attempt at a comprehensive evaluation app available for any touch-based device. With the key features described, evaluA+ promises to be a significant step towards full digitization of student assignment evaluation that is centered around grading rubrics. Furthermore, the app creates a strong platform for providing rich individualized feedback. It is understood that the app is still under development and that there are some key features that are lacking. That said, we intend to solicit feedback on the app's usability and feature set from educators both individually and by presenting this work at conferences. Considering the wide range of evaluation needs and instructor preferences, pilot studies will be conducted with educators using evaluA+ for grading over a single term to develop a robust evaluation tool. In a broader sense, evaluA+ can potentially pave way for future development of assessment tools that

leverage touch-based portable devices for teaching and to enhance the students' learning experience.

Acknowledgements

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References

1. SAGrader Website, https://www.sagrader.com, accessed Sunday, January 6, 2013.
2. Blackboard Inc. Website, http://www.blackboard.com, accessed Sunday, January 6, 2013.
3. Engrade, https://www.engrade.com, accessed Sunday, January 6, 2013.
4. Moodle Website, http://moodle.org, accessed Sunday, January 6, 2013.
5. W. Schilling, "Using Your Grade Book to Store Course Rubric Information," *Proceedings of the ASEE Annual Conference and Exposition, June 2009, Austin, TX.*
6. ProfHacker, "Grading with Voice on an iPad," http://chronicle.com/blogs/profhacker/grading-with-voice-on-an-ipad/40907, accessed Sunday, January 6, 2013.
7. S. Bakrania, "Getting Students Involved in a Classroom with an iPhone App," *Proceedings of the ASEE Annual Conference and Exposition, June 2012, San Antonio, TX.*
8. Essay Grader, http://gatsbyslight.com/essay-grader.php, accessed Sunday, January 6, 2013
9. Desire2Learn, https://itunes.apple.com/us/app/desire2learn-assignment-grader/id496587100?mt=8, accessed Sunday, January 6, 2013.
10. Speed Grader, https://itunes.apple.com/us/app/speedgrader-for-ipad/id418441195?mt=8, accessed Sunday, January 6, 2013.
11. HighMarks, https://itunes.apple.com/us/app/highmarks/id505953578?mt=8, accessed Sunday, January 6, 2013.
12. K. Alfrey and E. Cooney, "Developing a Rubric to Assess Critical Thinking in Assignments with an Open-ended Component," *Proceedings of the ASEE Annual Conference and Exposition, June 2009, Austin, TX.*
13. D. Jones, "Successful use of rubrics to assess student performance in capstone projects," *Proceedings of the ASEE Annual Conference and Exposition, June 2010, Louisville, KY.*
14. H.G. Andrade, "Understanding Rubrics," http://learnweb.harvard.edu/alps/thinking/docs/rubricar.htm, accessed Monday, January 7, 2013.
15. acedemiPad, "The ultimate guide on how to annotate PDF files on the iPad," http://www.joachim-scholz.com/academipad/2012/01/29/ultimate-guide-annotate-pdf-files-ipad/, accessed Monday, January 7, 2013.