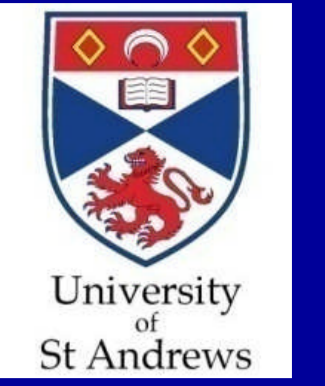


Using mobile digital notetakers to enhance feedback in physics teaching

Antje Kohnle, Aly Gillies, Natalia Korolkova

School of Physics and Astronomy, University of St Andrews



Introduction

At the University of St Andrews, Junior Honours (year three) core modules in physics are accompanied by small-class tutorials. Lecturers hand out problem sheets, and a subset of the tutorial problems are summatively assessed. With the aim of increasing promptness, quality and quantity of feedback to Junior Honours students on tutorial work, we purchased mobile digital notetakers (Acedad A4 Digimemo, 80 in total) for the entire Junior Honours class and the tutors. This was made possible by a substantial contribution from the University of St Andrews Strategic Enhancement of Learning Fund. The notetaker simultaneously records handwritten and digital versions of notes.

During the 2008/09 academic year, students wrote out their assessed tutorial solutions using the notetakers, uploaded their notes and submitted work electronically via email. Tutors then marked the work electronically using the same make of notetaker and sent the marked work back to students by email. Students were encouraged to look through the feedback, formulate questions or try to improve their solutions prior to the tutorial. We surveyed students using a questionnaire at the end of semester 1 and semester 2, and asked tutors for feedback on their experience with the notetakers.

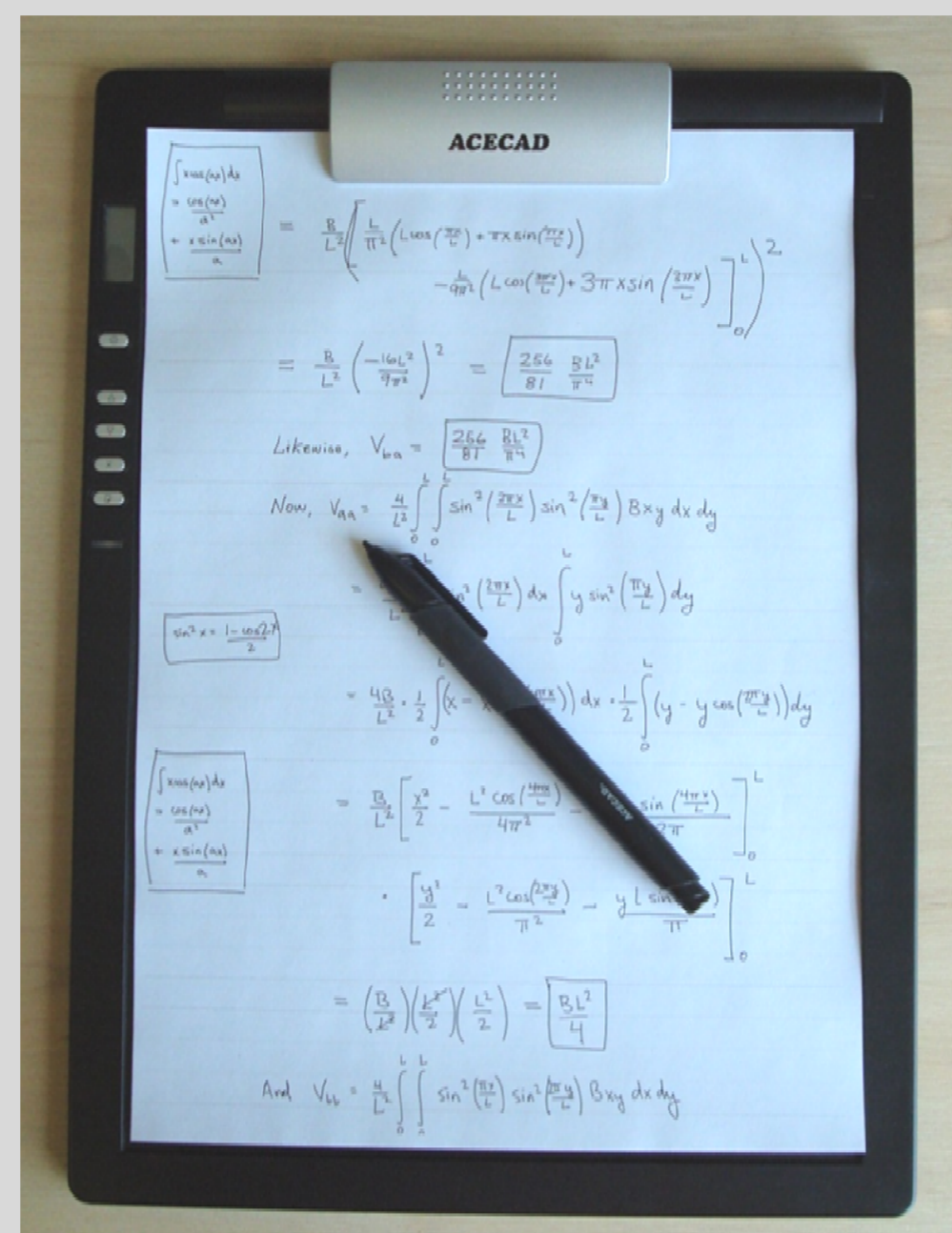


Figure 1: The Acedad A4 Digimemo digital notetaker.

Project Outline

The notetakers were lent out to the students via the physics library in pre-sessional week. We ran induction sessions in our PC classroom, where students were shown how to create, upload and email digital notes and how to use the notetaker software. We had cables fixed to several PCs in the classroom, so that students did not need to bring a cable to be able to upload notes in the School of Physics. Students could install the software on their own computers to make submissions from home possible. Tutors were given the notetaker and shown individually how to mark work using their system. In semester 1, the notetakers were used in the modules Thermal and Statistical Physics, Quantum Mechanics 1 and Maths for Physicists. In semester 2, the notetakers were used in the modules Quantum Mechanics 2 and Electromagnetism. Student numbers on all these courses ranged from ~50 to ~70. In semester 1, the notetaker was used by all tutors (eight in total), in semester 2, the notetaker was used by all excepting one tutor (five in total). In semester 1, tutorial submissions of assessed work were typically biweekly, and tutorials discussed mostly the assessed problems. In semester 2, a new scheme was introduced, whereby feedback on assessed problems was given only via the notetakers. Tutorials focussed on the un-assessed problems, which were similar to the subsequent week's assessed problems, and students were expected to bring their solutions to the un-assessed problems to the tutorial. Also, the frequency of assessed tutorial submissions was higher in semester 2, namely weekly. The aim of this new scheme in semester 2 was to encourage more students to work on the unassessed problems.

Evaluation after semester 1

In the last week of the semester, we surveyed the students in the three first semester core modules on their use and experience of the notetakers and any problems they had encountered. The questionnaire consisted of multiple response questions and the opportunity for free-text comments. The surveys were handed out to the students and collected by the class representatives. Of 62 students surveyed, 39 (63%) returned the questionnaire, 17 with additional written comments. There were some issues concerning technical problems. 59% of students stated that legibility of tutor comments was a problem. Students saw advantages of using the notetaker, notably the prompt feedback (46%), always having a copy of their own solutions (61%), being able to think through the feedback prior to the tutorial (56%), and the use of the notetaker freeing up tutorial time (34%).

Most students received their work back in sufficient time prior to the tutorial to be useful (29% always, 46% most of the time, 39% sometimes, 5% never). Figure 2 shows uses made of the feedback.

Tutors commented that it took longer to mark than for handwritten work, that it was more difficult to mark all students' solutions to one problem simultaneously with a large number of students, and that the printing out of the students' work was very slow.

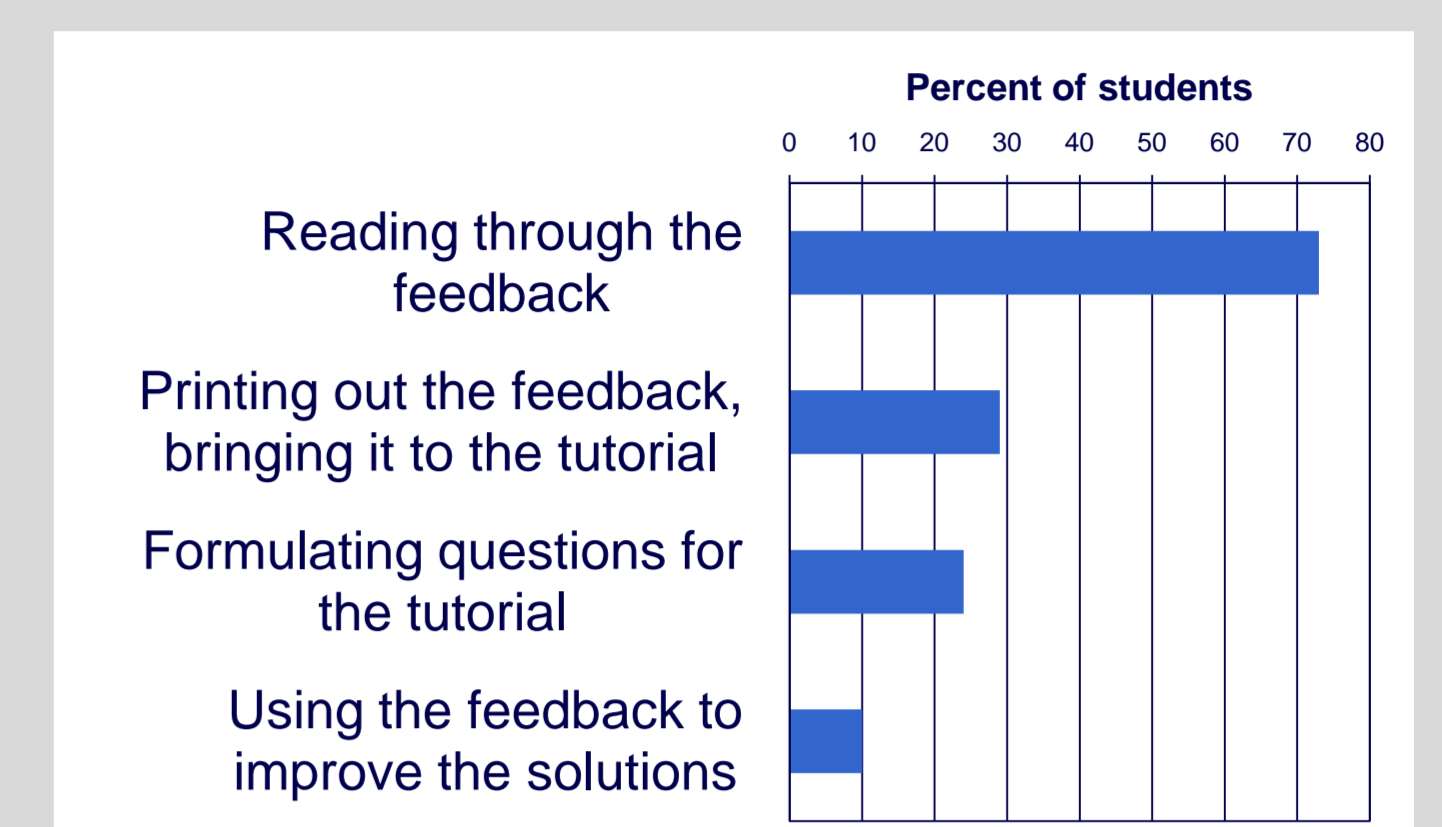


Figure 2: Uses made of feedback in semester 1

Outcomes for semester 2

In response to the student and tutor evaluation results in semester 1, a number of changes were introduced in semester 2. Students were requested to only hand in their tutorial solutions electronically, not the paper and digital version. Tutors were encouraged to mark work from the screen, thus saving paper. Tutors were requested to use textboxes and type comments wherever possible in order to increase the legibility of the tutor comments. This has the added benefit of making it easy to copy/paste comments from one piece of work to another, in the case where more than one student has made a similar error. As stated above, in semester 2 only written feedback was given on the assessed tutorial problems, and tutorial submissions were weekly instead of biweekly. In the last week of semester 2, the same questionnaire as in semester 1 with additional questions comparing the two semesters was handed out to the students. There were 37 returns in semester 2.

In contrast to semester 1, the majority (81%) of students handed in work only electronically, not electronically and on paper. Thus, most students had a printed and electronic copy of their tutorial work at all times. The additional time required by using the notetaker was however only slightly reduced in semester 2. Of those students using the notetaker in both semesters, 12% experienced more technical problems, 69% about the same and 19% less technical problems than in semester 1.

Tutor use of textboxes for typed comments wherever possible led to a substantial improvement in the legibility of tutor comments. In semester 1, 59% of students reported problems with legibility of tutor comments, in semester 2, this was reduced to 24% of students.

One of the major difficulties in semester 2 was the high frequency of weekly tutorial submissions and a substantial increase in the total amount of tutorial work, which led to several tutors not being able to send back marked work promptly.

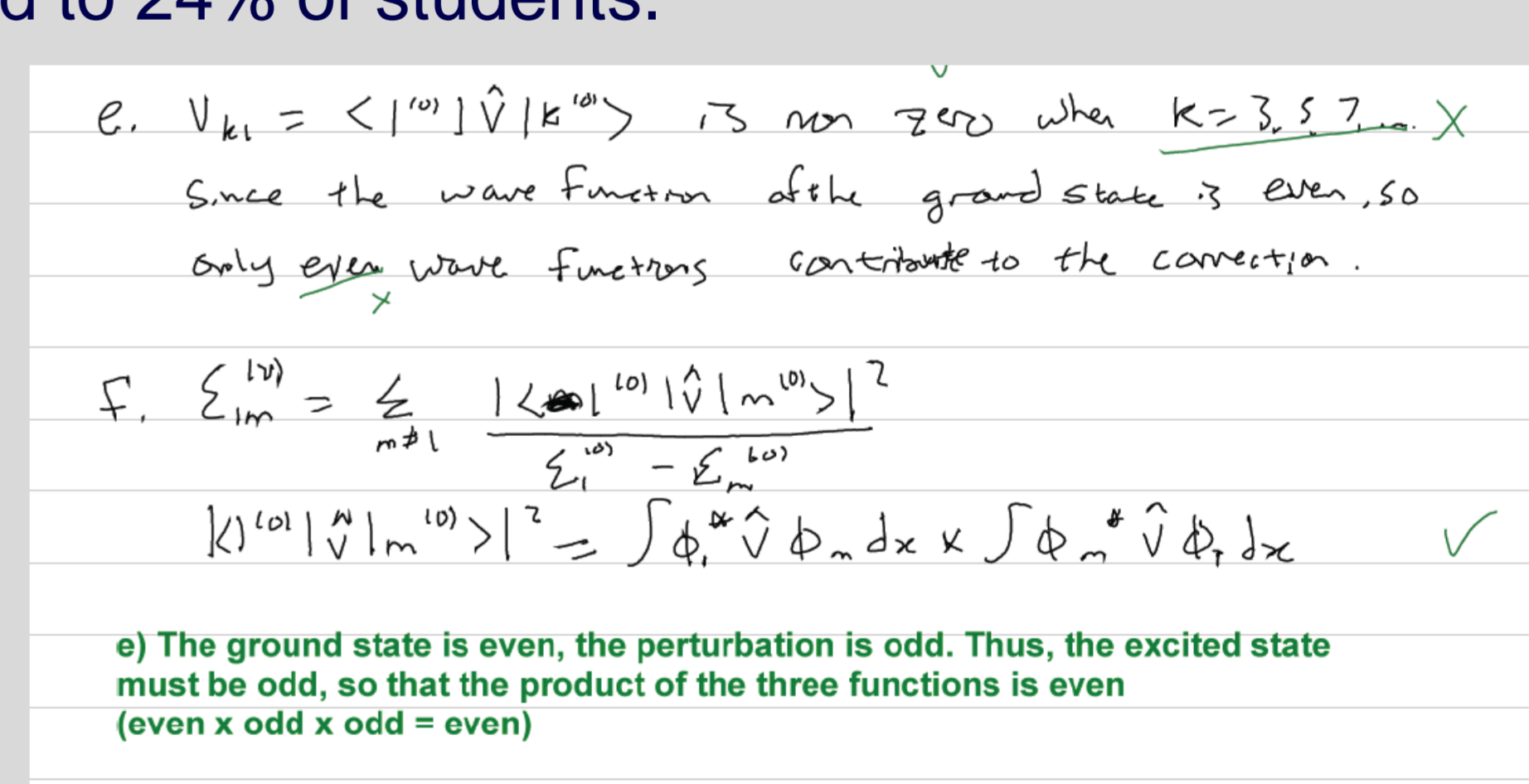


Figure 3: Tutorial work marked with the digital notetaker.

Summary

Advantages of the digital notetakers include

- Promptness of feedback, students being able to work through feedback prior to the tutorial.
- Students having a copy of their tutorial work at all times
- The possibility of projecting parts of student work during the tutorial
- Ease of submission of tutorial work, such as from home
- Possibility to erase / append / copy text using the notetaker software
- Tutors keeping a digital repository of tutorial work, such as for audits or academic misconduct investigations

Not all of these advantages were realized fully this year. Ongoing difficulties include

- Legibility of student handwriting and tutor comments
- Technical problems, in particular overwriting a page
- The notetaker software is not ideally suited to marking tutorial work.

We plan on continuing the use of digital notetakers in the next academic years, making the scheme voluntary instead of compulsory, and exploring more fully the advantages of the notetakers.