Board 128: An Automated Management Process for Digital Correction

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Poster: An automated management tool for digital correction

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Background

Feedback, as a component of grading, plays an essential role in the success and motivation of learners, but traditional written feedback presents many challenges related to constraints of time, space and understanding by learners [1, 2]. Feedback is also rarely consulted according to many teachers and only the grade matters for the student [1-3]. Studies indicate that the use of Information and Communication Technologies (ICT) would make it possible to respond to certain limitations of traditional feedback. For example, ICT would make it possible to give more feedback, facilitate learner ownership [1] and promote their academic performance [4]. Among ICTs, we note that the digital tablet has now become an essential tool in the field of education. The results of a survey of 6,057 students and 302 teachers in Quebec [5] reveal that 20,000 tablets are in circulation in Canadian schools and 8,000 in Quebec schools. Although there is little research on the educational uses associated with them, everything seems to indicate that digital tablets are an emerging technology capable of bringing significant benefits in education in the very short term [5, 6]. This project explores the digital grading of assessments to achieve quicker and broader feedback to students.

When students complete an assessment activity, the teacher's corrective work begins. It is done under the pressure of time. However, correcting in a relatively short time may affect the quantity and quality of feedback. It is therefore not surprising that the teacher is thinking of time-saving solutions to provide and further enrich their feedback while offering rapid correction.

Traditionally, in mechanical engineering courses featuring multiple groups and a large population of students, the grading is organized so that each teacher corrects an open-ended engineering problem on an exam for all groups in the same course. Correcting this way is fairer and faster than correcting every page of a copy. This method also blurs the Pygmalion effect in the sense that the anonymity of the copies is ensured. The downside is that the teacher must wait for a colleague's papers to return before they can correct their question. To recover this lost time, we developed an automated digital correction management tool that uses the Python programming language to manage digitized assesments.

Methodology

The tool automatically splits scanned student copies by question into pdf format and then assembles, for each question, all student copies into a single file. A customized exam booklet, with known allotted number of pages for each question, was produced to ease the process. The assembled files are uploaded to a cloud storage platform, where each teacher can access their assigned file for handwritten correction on a tablet using a digital pencil (see Figure 1). The assembly creates a given file for each corrector, avoiding any overwriting of the file and online version management improves the quality of the feedback while grading the copies. The marks for

each question are entered on a shared spreadsheet on the cloud storage platform. Thus, the teacher corrects at his own pace, avoiding conflicts with other correctors. The anonymity of copies is guaranteed since the identification page of the exam booklet is absent from the assembled files, and the equality of chances is reinforced. If there are more questions than markers, one of the markers may be assigned more than one question to mark.

When the correction is complete, a handwriting recognition algorithm is used to extract the marks assigned to each question by the correctors. The copies are reassembled and the mark is assigned automatically for each question on the main page of the exam booklet, before uploading the graded copy on the teaching platform (see Figure 2). The integration of the tool into the correction process is seamless as the copies are graded in the same manner as usual – albeit on a tablet. The splitting, recognition and reassembling tools are only operated by the course coordinator, which ensures an efficient correction process. The coordinator is a teacher who acts as the course manager.

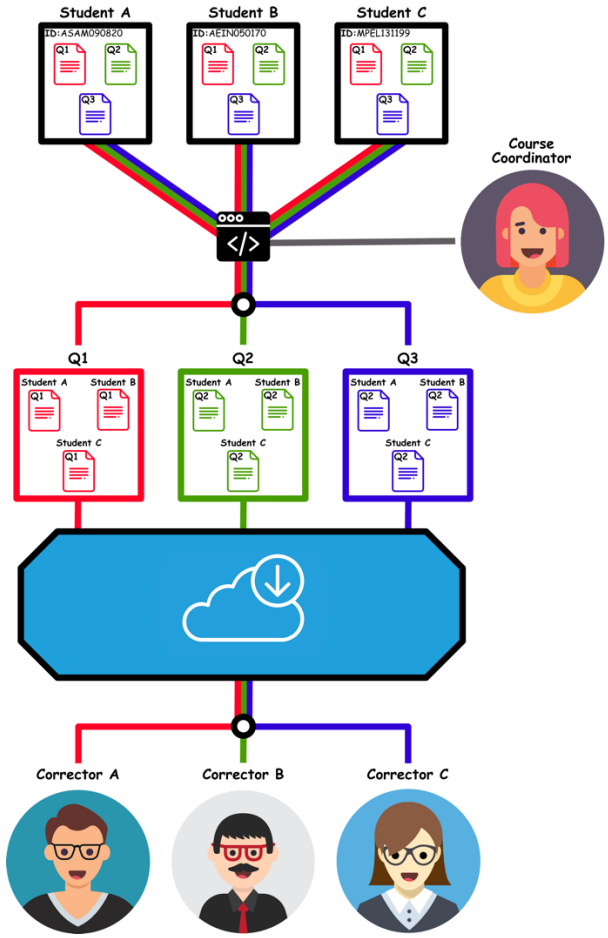

Figure 1: Splitting process

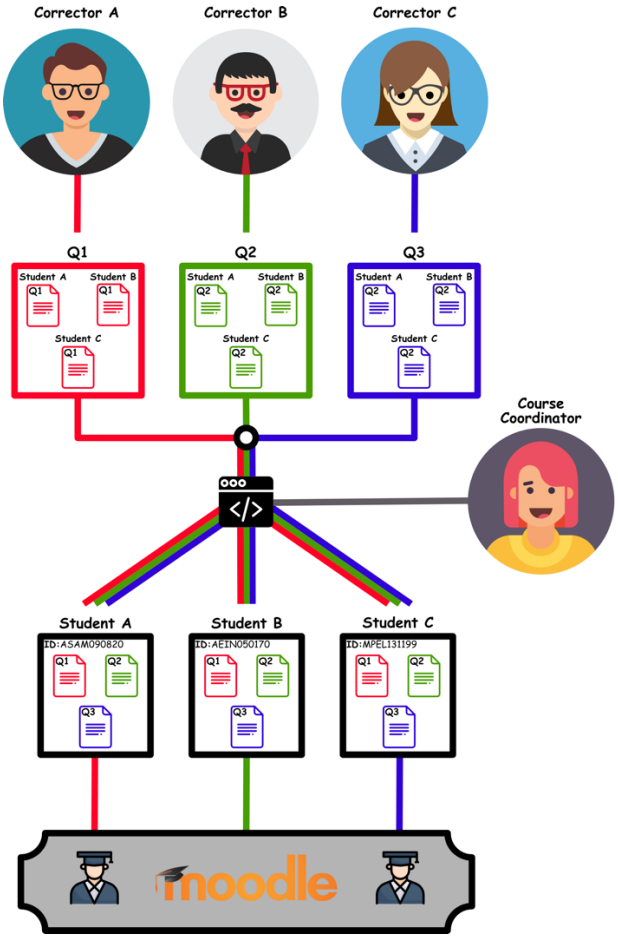

Figure 2: Reassembly process

Preliminary results

Digital correction allows both the student and the teacher to benefit from the advantages of digital technology. It saves the teacher the need to carry a large number of copies and reduces the risk of loss of copies. When dealing with several correctors, it nullifies the waiting time between the group of copies. For example, a traditional correction on paper that usually takes two weeks in the MEC1410 course is reduced to 10 days thanks to this new automated digital correction management tool. Correction time is reduced while providing maximum feedback during correction. This is the reason why this tool has been democratized in the mechanical engineering department and is now used in several courses: MEC3200 (230 students per year), MEC1415 (140 students per year), MEC1410 (405 students per year). We would like to extend this approach to courses MEC2115 & AER2100 (177 students per year) and MEC1420 (318 students per year).

Electronic delivery of copies to students also frees up the classroom time usually reserved for handing in copies. This time is now used more efficiently by the teacher to give feedback to the class. The teacher takes the opportunity to share the points that were successful and the less successful in order to allow students to correct their understanding of the subject. It gives them more time to process the various comments and applying them while moving on to the next chapters of the course. Finally, correction times are now shorter compared to traditional correction, which is beneficial to student learning. As Berthiaume and Rege Colet [7] point out, the more feedback is given in a short time, the more effective it is.

Conclusion

Thanks to the automated management tool put in place, the teacher maximizes his correction time to give more quality feedback on the copies. The time usually reserved in class for the return of lessons is now used more by the teacher to give his appreciation to the whole group. The number and quality of feedback now allow students to better assess their strengths and weaknesses in achieving their learning objectives.

Future Plans

Currently, the grades must be entered by the proofreader in an Excel file before the copies are assembled. Since, in a second step, the Python code developed will read the Excel file, write the marks per question on the main page of the exam booklet and add up to provide the final mark. The final grades are then entered manually in the Excel file and sent to the secretary.

Soon, we aim to advance the digital correction process by automating the phase of entering and exporting notes by introducing a handwriting recognition algorithm and automatic export of notes in the Excel file. The entry of notes on Moodle, done manually for the moment by the teacher will also be automated.

The tool will then take advantage of the data generated on a per-question basis and provide personalized statistics to students. Histograms of the global results distribution can be printed on the front page of the corrected digital copies, with the group average and the student's result identified. Per-question results can also be printed using boxplots, giving students quantified feedback.

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