

Lightwork Evaluation Report

August 2010

Executive Summary

Lightwork is a new open source e-learning application for the management and marking of assignments. Lightwork operates in conjunction with the Moodle learning management system. Lightwork has been developed with funding from the Tertiary Education Commission of New Zealand under the leadership of Massey University. The application is strongly based on educational assessment theories and addresses the lack of functionality of Moodle in regard to assignment management and marking.

In semester one of 2010 the first version of Lightwork has been trialed at five New Zealand tertiary institutions. An evaluation study has been carried out, analyzing the experiences of 22 lecturers, tutors and markers, across four institutions, who have used Lightwork for their assignment marking tasks.

The evaluation has given strong indications that Lightwork contributes to efficiency and quality in assignment marking. Lightwork is fully compatible with established assessment theories. It encourages transparency and consistency in assignment marking, as well as personal reflection and dialog within marking teams and teaching groups.

Considering assessment is one of the most important factors in student learning, Lightwork should be adopted by institutions to enable staff to conduct assignment assessment efficiently and with high quality.

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Introduction

Lightwork has been designed to support the management and marking of assignments in tertiary education settings. Lightwork aims at improvements both in efficiency and quality of marking. Lightwork is an open source application that works in conjunction with the Moodle learning management system. Teachers set up assignments in Moodle, students submit their work to Moodle and receive their marking results via Moodle. Lightwork supports teachers in the administrative steps necessary around marking and in assessing student work in educationally sound ways.

Lightwork is based on close to ten years of research, conducted by Dr Heinrich with research students, in the areas of assessment theories and e-learning. A 2006/7 project funded by the Tertiary Education Commission of New Zealand (TEC) evaluated the needs of lecturers in the New Zealand tertiary sector in regard to assignment and e-learning support. Based on these foundations further funding was awarded by TEC towards the end of 2008 for creating an educationally sound e-learning tool for the support of assignment marking in the tertiary sector. This funding resulted in the Lightwork project. Dr Heinrich led the project for Massey University. The project partners were from the University of Waikato, the University of Canterbury, The Open Polytechnic and the Wananga o Awanuiarangi.

An evaluation was undertaken to establish if Lightwork has fulfilled its aims of supporting assignment marking in efficient and educationally sound ways. This report describes evaluation steps and results. It is aimed at helping institutions in deciding whether they want to adopt Lightwork into their e-learning toolsets.

Background

This section provides background information. It summarizes findings from the earlier TEC project on e-learning tools in the area of assignment marking. The assignment related capabilities of the Moodle learning management system are described. The features of Lightwork and its development in two major versions are outlined.

Literature on Assignment Assessment

As part of the earlier mentioned 2006/7 TEC-funded project a literature review on assignment marking and e-learning support was conducted. The full report is available at <http://etools/documents/LitReview101006.pdf>. The following presents a brief summary of this literature review.

Assessment tasks influence the direction and quality of student learning (MacLellan, 2004). Most assessment tasks combine formative and summative purposes. The formative purposes involve structuring, guiding, and enhancing student learning. The summative purposes involve certifying and reporting student achievement and admitting students to subsequent learning opportunities. There is an inherent tension between formative and summative assessment purposes, especially if the same assessments are to be used for both purposes (Crooks, 2004). A number of research and policy papers indicate the important impact that assessment practices can have on student learning and motivation (Assessment Reform Group, 1999, 2002; Black & Wiliam, 1998a, 1998b; Crooks, 1988; Harlen & Crick, 2003; Hattie, 1999; Madaus, 1988; Shepard, 2000). Providing high quality feedback on student work is a very powerful way of raising the standard of student work (Wiliam, 1998a, Black and Wiliam, 1998b).

Most writers on formative assessment or feedback on student work indicate that a good balance between criticism and positive comments is most effective. Students pay attention to comments that they perceive to be useful and constructive. Comments on strengths make them more receptive to other feedback, while the most effective comments on weaknesses not only identify weaknesses but also suggest how these might be addressed. Higgins et al. (2002) report that students, despite paying lots of attention to grades, have an intrinsic motivation to learn from feedback. The potential of influencing student learning with formative feedback is large. To achieve this, timely feedback is vital. Feedback must explain misconceptions and suggest pathways to improvement.

The nature of assignment assessment poses a range of challenges for the marking process. Knowledgeable human markers are required for judging the quality of responses (Hanna & Dettmer, 2004). The marking of essays is very time consuming and the reliability of the marking can be very low (Linn & Miller, 2005; Nitko, 2004). To address these challenges the literature very coherently presents a picture of suggested techniques and procedures (Gronlund, 2006; Hanna & Dettmer, 2004; Lambert & Lines, 2000; Linn & Miller, 2005; Nitko, 2004).

Successful marking starts with the definition of the assignment questions. These questions need to be clearly linked to learning outcomes. It has to be assured that the most suitable form of assessment is chosen for the learning outcomes targeted. Next, the marking has to be guided by a marking rubric. The availability of a marking rubric allows the marker to focus on the learning outcomes to be assessed. The

importance of feedback needs to be emphasised. The marker should provide feedback to each student, outlining strengths and weaknesses in their work and guiding towards further learning (Linn & Miller, 2005; Nitko, 2004; Torrance & Pryor, 1998; Tynjala, Mason, & Lonka, 2001).

Impact of Electronic Assignment Submission

As well as part of the 2006/7 TEC-funded project interviews with 90 lecturers across five New Zealand tertiary institutions were conducted to establish the impact of using electronic assignment submission. The full report is available at <http://etools/documents/InterviewAnalysisReportWithQuotes3.pdf>. The following sections present a brief summary of this report.

A range of benefits from electronic assignment submission to both students and lecturers emerged. The benefit that was referred to most often was e-learning tools assisting in administration issues. Following behind this, time and resource saving were identified as major benefits, in addition to facilitating group activity, the removal of geographic limitations, improving the quality of marking and feedback, and having an archive of student work.

Lecturers emphasised the advantage that e-learning tools provide in managing assignments. Lecturers identified that setting assignment due dates at convenient times for students and lecturers alike, and being able to check if assignments were handed in on time were particular advantages of using e-learning tools. Assignments can be received electronically from each student, making it easier to file and organise submissions for marking purposes than is the case with paper assignments. Related is the benefit often being able to keep track of student assignments. A particular advantage of electronic submission is that it prevents assignments from being lost.

Efficient return of student assignments was another advantage discussed by lecturers. Removing the limitations associated with distance learning was a particular advantage for distance students who live in different cities or countries. They now can fully participate in a course, submit and receive assignments without having to wait for the mail delivery, and can also communicate with and gain feedback from the lecturer as well as other students.

Time savings related to a number of factors for both students and lecturers alike, including saving time waiting for assignments and returning assignments to students, saving time by typing comments instead of handwriting them, the ability to copy and paste similar comments rather than writing them out each time, and giving students the option to hand in assignments up to the last minute online. Some lecturers commented that giving feedback online saved time and has the benefit of being easier to read for students.

An important benefit noted by lecturers was improved quality of marking and feedback. A number of lecturers emphasised that using online tools allowed for the provision of more feedback that was more detailed. In some large classes, the use of e-learning tools facilitated the provision of feedback where none would have been given in the past as it would take too long. In addition to this, the use of some online tools facilitated a more reliable and transparent system and allowed lecturers to feel more confident in their marking and assessment processes. Finally, one other major benefit of using e-learning tools to mark assignments from the lecturer's perspective is the ability to quickly screen for plagiarism.

Moodle Functionality for Assignments

Moodle offers core functionality around assignment assessment. The teacher can define an assignment and set parameters such as due date, late submission options and marks available. Students are provided with an interface within Moodle for uploading their work. Moodle stores the student submissions and keeps record of the submission dates. If institutions have installed the Turnitin extension to Moodle student submissions are sent to Turnitin for similarity checking. A similarity index and a link to the similarity report are returned to Moodle and are available to the teacher and optionally to the students.

The teacher can see how many assignments have been submitted. To assess an individual student's work the teacher can download the work to their computer and open it there with a suitable application, e.g., a word processor or a spreadsheet program. In Moodle the teacher has an interface that allows entering a mark or grade for the student and a textual comment for providing feedback. The teacher can upload a document for the individual student. This might be a document containing more detailed feedback or an annotated version of the student's work. The mark or grade the lecturer has entered is transferred automatically into the Moodle Gradebook. Students are notified via email when their work has been marked and can see their mark or grade, the feedback provided and any documents uploaded for them.

With this functionality Moodle provides basic support for the marking of assignments, but fails to address efficiency and quality of marking. The solutions provided do not scale up to large or even medium class sizes, with many repetitive manual steps required by the teacher. Important concepts like marking rubrics or marking teams are not integrated. These shortcomings are not limited to Moodle but are prevalent in all major learning management systems.

Lightwork Functionality

Lightwork has been designed with the aims of increasing the efficiency of marking and making educational theories on assessment more easily accessible. Guiding principles have been to build on what is already available in Moodle and on retaining the student interface to Moodle. This means that students are not required to use Lightwork. Students continue to submit their work to Moodle and receive their results via Moodle. Teachers still setup assignments in Moodle and use the Moodle Gradebook as repository of marks.

Lightwork has been developed in two main iterations. Lightwork Version 1 contains the following core functionality:

- Analytic marking rubric: Teacher defined criteria that describe to students and markers what should be achieved and what sub-marks are available. Instructions to markers and banks of frequently used comments are integrated into criteria descriptions to guide the marking and make giving feedback more consistent and efficient.
- Allocation of markers: Links are created between markers and students to make it explicit which member of the marking team assesses which students. The allocation can be done on individual basis or across the whole class following various allocation algorithms.

- Marking feedback via marking sheets: For each student a marking sheet is created automatically. This marking sheet is based on the marking rubric and is ready for use without requiring any manual copy and paste steps.
- Download of student work: The work students have submitted is downloaded to the marker's computer for the students assigned to the marker. If the student work has been submitted as compressed archive file it is extracted automatically.
- Upload of annotated student work: Markers can use programs external to Lightwork for annotating student work with inline comments (for example, use track changes in Microsoft Word). Annotated student files are uploaded to Moodle automatically together with the student's marking results.
- Overview on status of marking: Teachers can monitor the progress of the marking done by the marking team via overview pages that are sortable by various criteria.
- Format of marking results: Students receive their marking results via the standard Moodle assignment interface. The marking results consist of the mark or grade achieved, feedback structured according to the criteria setup for the marking rubric and optionally annotated student work.
- Controlled release of marking to students: The teacher can review the work done by the markers. Only the teacher can release marking results to students. The teacher decides when and for whom marking results are released.
- Export of marks into spreadsheet file: To facilitate import of marks into institutional result processing systems results can be exported into spreadsheet files. The teacher can decide on the level of marking detail exported to facilitate detailed statistical analysis of the marking.
- Offline work: Once course, assignment and related marking data have been downloaded from Moodle no network connection is required for marking. A network connection is required again to upload marking data to Moodle and to exchange marking data with members of the marking team.

Lightwork Version 2 contains a variety of improvements to Version 1 functionalities and provides the following extensions:

- Holistic marking rubric: Holistic marking rubrics add description of quality levels for each criterion. A wizard guides the teacher in setting up holistic marking rubrics.
- Annotation of student work in Lightwork PDF Annotator: Student work that is available in PDF format can now be annotated within Lightwork using the Lightwork PDF Annotator. This provides for the linking of inline comments to the criteria of the marking rubric.
- Team assignment support: A new Moodle assignment activity type allows students to form teams and submit work together. The team membership is transparent to Moodle and Lightwork. The marking occurs on team level and all team members receive copies of the marking results.
- Integrated help pages: Context sensitive help is available within Lightwork. The help pages can be viewed via an index structure and exported into a single document.

- Support of Turnitin link to similarity report: If Turnitin integration has been enabled for the Moodle site the link to the Turnitin similarity report and the similarity index are available from within Lightwork.

The evaluation reported on here is based on the use of Version 1. Lightwork Version 2 is scheduled for release into production in August 2010 for use in Semester 2 of 2010.

Technical Requirements for the Use of Lightwork

Lightwork is an application that is installed on the user's personal computer. Windows, Macintosh and Linux versions are available. Installation on the user's computer only requires the download of an installer file and the execution of this file.

Lightwork works in conjunction with a Moodle site. To be able to connect to a specific Moodle site this site has to be Lightwork enabled. This requires the Moodle site administrator to add web service files and database extensions, as well as map Moodle roles to Lightwork capabilities. These changes are not technically difficult. The Lightwork extensions to Moodle have been security reviewed by Catalyst Ltd., a New Zealand Moodle partner.

The Lightwork application installed on the user's personal computer and the extensions to the institution's Moodle site together provide the Lightwork functionality. The two parts have to match in version number. Lightwork works with Moodle 1.9 sites. It will have to be modified for Moodle 2.0.

Lightwork Maturity and Use in Participating Institutions

Lightwork Version 1 became available in March 2010 and was installed against Moodle sites at the participating institutions. Issues discovered in use of this first version have been resolved during the development of Version 2.

Different institutions have reacted differently to the need of modifying their Moodle sites. The decision about installing Lightwork on their Moodle sites depended on factors like an institution's level of formality in their Moodle site administration and their in-house technical capabilities. In some institutions there was a hesitation to install Lightwork on Moodle production sites before evaluation reports were available. At the same time, gaining the user experiences in an institution's own environment required Lightwork installation on their Moodle site. As a compromise Lightwork was installed against Moodle test sites at some institutions. This influenced the user experience of some participants in the evaluation.

Evaluation Design

This section describes the evaluation design applied by reporting on the method chosen, the sampling and the analysis steps.

Method

The evaluation underlying this report was carried out using semi-structured interviews. The primary target group for the interviews were academics teaching at tertiary institutions in New Zealand who had previously used Lightwork. The first interview questions aimed at establishing the assignment and marking context of the interviewees. The following questions targeted the potential effects of using Lightwork on efficiency and quality of the management and marking of assignments. The potential effect of using Lightwork on knowledge around assignment marking was explored. The interviews concluded by discussing marking rubrics used by the interviewees and asking if permission would be given to add the rubrics to a set of sample rubrics, aimed at allowing others to see working examples. The interview questions are available in Appendix A.

Some of the interviewees were marking assistants who supported academics in the marking of assignments using Lightwork. For these interviews the schedule of questions was slightly modified. The assignment and marking contexts would already have been established in interviews with the academics. The questions around permission to use a marking rubric as example were not relevant as this decision would lie with the academic leading the marking. The main sections of the interview schedule on efficiency and quality remained the same.

The evaluation project has undergone full ethics approval by Massey University. Permission to interview staff had been given by all participants' institutions.

The evaluation study, including interviews and analysis, was conducted by Dr Heinrich, who is an experienced academic and e-learning researcher. She is also the key person behind the Lightwork project. While great care has been taken to be objective, this evaluation report is not an independent report.

Sample

A total of 22 interviews with participants from four New Zealand tertiary institutions were conducted. Sixteen of these participants were teachers or academics in charge of the assignments that were object of the interviews. These participants are referred to as 'lecturers' in this report, regardless of their academic rank or position. Two participants had the role of providing administrative and marking support to the lecturer in charge of a course. These participants are referred to as 'tutor'. Five participants were employed as assistants to mark assignments under the guidance of the lecturers and the tutors. These participants are referred to as 'markers'.

The invitation to participate in the evaluation study was sent to known Lightwork users at the participating institutions. All individuals who agreed to participate were interviewed, with the exception of two individuals with whom arrangements in the timeframe available could not be made. One tutor and markers were approached by the lecturers they worked for.

The level of Lightwork use across the participants was varied. Five lecturers had not been able to complete the full cycle of working with Lightwork through to the release of marking to students. The reason for this was that, at the time the marking had to be finished, the setup of Lightwork against the lecturers' institutional Moodle production site had not been completed. These lecturers were still able to provide feedback on using of Lightwork, based on their familiarity with Lightwork and tasks conducted in Lightwork, as for example the definition of marking rubrics. The other lecturers used Lightwork for the complete marking of one and up to three assignments. One tutor and all markers contributed to marking where Lightwork was used for the complete marking cycle.

Lightwork is a very new application that only became available in Semester 1 of 2010. The lecturers who volunteered to try Lightwork in this semester, and subsequently became interview participants, all need to be considered as early adopters in terms of Lightwork. Yet, not all of these lecturers had used Moodle previously for assignment submission. For some it was the first use of Moodle and at the same time the first use of Lightwork. Two of the lecturers had used the predecessor tool to Lightwork, an application called WebCTConnect. The transitions lectures made in their marking environments are referred to throughout the analysis section of this report.

Analysis Steps

The interviews with the participants were audio recorded and transcribed. The analysis of the transcripts was guided by a number of criteria. First, the task and marking contexts of the participants were considered. Data were extracted that relate to the subject areas of the assignments, the class sizes, the type of student work requested for the assignment and the file formats submitted. The composition of the marking team was looked at in terms of number of team members and their roles in the marking process.

Next, the marking approaches practiced before using Lightwork were analyzed as knowledge of these is essential for interpreting responses on the effect of using Lightwork. Information on the approaches was extracted and sorted into several categories. Shortcomings and advantages of these pre-Lightwork approaches were summarized.

The focus of the analysis then turned to addressing issues around efficiency and quality based on Lightwork use. Any statements on efficiency and quality had to be set against the specific assignment circumstances of the participants and in particular their reference points to paper or electronic assessment. While focusing on efficiency and quality a number of other criteria surfaced. These have been noted and grouped, again considering context and previous system use.

Evaluation Results

This section reports on the evaluation results. While these results are sorted according to main criteria there is a strong interdependency between criteria. This has been addressed in reporting and also means that several issues are discussed from different perspectives under the various headings.

Task and Marking Contexts

The lecturers interviewed were teaching in the following subject areas: accountancy, computer science, education, healthcare, information systems, information technology, languages, law, management, physiology, psychology, sociology and sports sciences. Students submitted work in the format of essays, reports, presentation material, calculations and computer programs. The files types of student work ranged from word processing documents, PDF documents, presentation slides and spreadsheets to compressed programming project file collections. The courses the assignments discussed belonged to include certificate, diploma, and university preparation levels as well as undergraduate and postgraduate degree programmes.

Table 1 shows class sizes of courses for which assignments were discussed, the composition of the marking teams used and the type of work submitted by students. In some cases several assignments for the same course were discussed. These are only listed separately if there were differences in types of student work or marking team composition.

Class size	Marking team	Type of student work
12	Lecturer supported by one marker	Essays submitted as word processing documents and planning documents submitted as presentation files
15	Lecturer only	Research reports and essays submitted as word processing documents
20	Lecturer only	Essays submitted as word processing documents
35	Lecturer only	Journals submitted as word processing documents
40	Lecturer only	Essays submitted as word processing documents
50	Lecturer supported by three markers	Lab reports submitted as word processing documents
70	Two lecturers	Web designs and evaluations submitted as HTML or word processing documents
70	Two lecturers	Short answers and presentation material submitted as word processing documents and presentation slides
75	Two lecturers	Essays and reports submitted as word processing documents
150	Lecturer only	Short answers submitted as word processing documents
200	Lecturer only	Short answers and calculations submitted as word processing documents

205	Lecturer supported by two markers	Essays and journals submitted as word processing documents
240	Lecturer supported by five markers	Programming project submitted as compressed file collections
250	Lecturer supported by six markers	Essays submitted as word processing documents
250	Lecturer supported by tutor and five markers	Essays submitted as word processing documents
370	Lecturer supported by tutor and five markers	Essays submitted as word processing documents
1000	Lecturer supported by four markers	Reports submitted as word processing documents and calculations submitted as spreadsheet files (which could be assessed automatically)

Table1: Assignment and marking contexts of assignments discussed for evaluation

Marking Approaches before Using Lightwork

The experience of using Lightwork needs to be seen in context of the approaches used previously. Some lecturers had already used electronic assignment submission via Moodle. For these lecturers the transition was in the addition of Lightwork. Some lectures had not yet worked with electronic assignment submission. For these lecturers both using the Moodle assignment module and Lightwork were new approaches. In the following these two different contexts are described as 'Paper only' and 'Moodle only' approaches to assignment marking. The main characteristics of these approaches are outlined. A variety of modifications, depending on assignment contexts and lecturer preferences, exist. Advantages and shortcomings of these approaches are discussed.

There is wide variety in composition and size of marking teams. While the characteristics of marking teams are independent of the use of e-learning tools, the availability of tools determines how the team members work together. The main forms of marking teams used by the participants are described below.

A specific example is provided showing how assignments were marked using Moodle but not Lightwork in context of a large class size and with large marking team.

Paper only

Students submit paper copies of assignments either by putting these into special drop boxes or by mailing them to the institutions. Usually some form of recordkeeping takes place to note who has submitted when, either at departmental or institution central level. If off-campus markers are employed assignments are posted based on a pre-defined marker allocation. This marker allocation is based on general characteristics, for example student names.

In most cases a marking rubric is used to guide the marking. It can contain further instructions to markers and a list of frequently used comments. These documents can be given to markers on paper or in electronic form.

For the marking the following variations are used:

- Inline comments only: The marker annotates student work directly with marks and comments.
- Marking sheets: The marker fills out a marking sheet containing marks and feedback for each student. The marking sheet is based on the marking rubric. Student details, like id number and name, have to be entered manually into the marking sheet for each student. This is either done on a paper copy or electronically and subsequently printed.
- Combination of inline comments and marking sheets: Both steps are done as described.

In either case the marks need to be recorded before returning marked work to students. This is done in a spreadsheet. If multiple markers are involved the separate spreadsheets need to be combined.

The marked student work and the marking sheets are returned to students. This is either done in class, via a departmental office for student collection or by mail-out from an institution central service point. If off-campus markers are used the marked student work can by-pass the lecturer responsible. Marked student work is usually not copied before being returned to students.

A number of concerns have been raised by participants in regard to paper only marking:

- Time delays: The handling of paper copies of student work causes considerable time delays, especially for distance students, many of whom live overseas.
- Lack of status information for students: Students who mail their work to the institution have generally no way of knowing if their work has arrived and which stage it has reached in the marking process.
- Lack of flexibility in marker allocation: The allocation of markers to students has to be predefined on general characteristics. This makes it difficult to tailor this allocation on a case-by-case basis.
- Inefficiencies: Manual steps are required for recording incoming work, creating marking sheets for each student and entering marks into a spreadsheet. Advantages of electronic systems like copy-and-paste cannot be taken advantage of if working on paper documents. If electronic copies of marking sheets are filled out these have to be printed and attached to the student work.
- Lack of overview on progress: The lecturer in charge cannot see the progress made by markers. Checking on progress requires separate communication.
- Difficulties with quality control: The lecturer in charge can only monitor the quality of the marking if they have access to the paper copies of student work. This requires markers to deliver or post these copies, which needs to be explicitly organized and has the potential of time delays. If markers return marked student work directly to students bypassing the lecturer in charge no quality checking is possible.
- High risk of errors: Manual steps are required in writing student details on marking sheets and transferring marks to spreadsheets. Errors caused by recording wrong details or marks can occur easily.

- Students do not receive feedback on their work: Students who do not attend lectures in which marked assignments are returned or who do not go to the departmental office fail to obtain the feedback put on their work. These students are likely to get hold of their mark, but miss out on the formative feedback.
- Problems responding to student queries on marking: As the lecturer does not retain a copy of the student work and the marking it is difficult to respond to student queries on marking. The lecturer has to rely on the student bringing back or mailing a copy of their work, which is not only time consuming but also carries the danger of the student making modifications after marking.

Some participants see advantages in working with paper submissions of student. Some lecturers prefer reading student assignments on paper instead of on screen. Yet, these lecturers also expressed their willingness to continue with electronic assignment submissions as they see the overall advantages outweighing this preference. Some lectures prefer annotating student work directly with pen on paper compared to doing this on the computer, yet acknowledge potential problems, like the difficulty for students to read the marker's hand-writing.

Moodle only

Using Moodle for assignment marking starts with the lecturer setting up an assignment definition in Moodle. The students submit their work for the assignment in Moodle. Moodle keeps a record of each submission. Students can see via the Moodle user interface that their work has been submitted.

The markers need to be setup in the course in Moodle in a role that allows marking. As Moodle does not provide for the allocation of markers to students such allocation needs to be handled outside Moodle. Among the participants in this study this is done allocating by alphabet or by Moodle groups. A spreadsheet might be kept to record this allocation.

Again in most cases a marking rubric is used to guide the marking. It can contain further instructions to markers and a list of frequently used comments. These documents are given to the markers outside Moodle as Moodle does not have the concept of a marking rubric.

To access the student work the marker downloads the appropriate files from Moodle and opens these files outside Moodle in the appropriate program on their computer.

To support marking Moodle offer the following features:

- A drop down box to select the mark for the student.
- A text area in which feedback can be entered.
- The possibility for uploading files one-by-one to be made available to the student.

Based on these features the following variations are used for the marking:

- Mark and textual feedback only: The marker selects a mark and enters feedback for the student into the text area. Usually this feedback will not make explicit reference to the criteria of a marking rubric, as Moodle does not have the concept of a marking rubric and any information relating to a rubric would have to be typed for every student. To provide better structured and richer feedback to

students some teachers create marking sheets outside Moodle in a word processing environment. A marking sheet is created for each student by copying the marking rubric. After the feedback has been entered the contents of the marking sheet is copied into the Moodle text area.

- Mark and marking sheet as external document: The marker selects a mark. As in the previous case the marker creates a marking sheet for the student as a word processing document. Instead of copying the contents of this document into the Moodle text area the marker uploads the document for the student. This means to select the correct document via a file selection box and needs to be done separately for each student marked.
- Mark, textual feedback or external marking sheet, and annotated student work: Some lecturers annotate student work directly as the equivalent of providing inline comments via hand-writing. This can be done with tools like Word track changes or with PDF annotation software. To return these annotated documents to the students the marker needs to again upload these documents via a file selection box individually per student.

Using Moodle for the marking means that the marks are automatically recorded. Once the marking is done students are notified via email. As the marking records are electronic, the lecturer has access to these records even after students have picked up their electronic copies.

Because the marking occurs in Moodle the teacher in charge can review the work of the markers. One issue here is that students can see their results as soon as these are entered into Moodle, making it difficult for a teacher to correct what a marker has done. The other problem is that marking appears in Moodle as marking progresses. This results in situations where some students have already received their marks and discuss these in the Moodle forums, while other student still wait for their marking. To prevent these situations some teachers hide the assignment activity form the students until all marking is finished. This in turn causes the problem of preventing late student submissions, resulting in email submissions to the teacher, which have to be handled manually.

The following advantages are noted when using the Moodle instead of the paper only approach:

- No time delays: Due to electronic submission there are no time delays for mailing assignments or waiting for face-to-face contact time to return paper copies.
- Less manual work: There are fewer manual handling steps as records of student submissions are kept automatically, marks are available directly in the system and students have direct access to the marking.
- More confidence for students that their work has been received: As students can see that their work is stored in Moodle they do not need to worry about submissions having gone lost. This reduces administrative overhead from student enquiries.
- Opportunity for plagiarism checking: Student work can be submitted for plagiarism checking.
- Some progress checking possible: If markers enter their marking directly in Moodle the teacher in charge can observe how the marking progresses.

- Less risk of errors: If all marking is done within the Moodle marking interface the risk of making errors in transferring marks or feedback is reduced.
- Convenient for students to pick-up feedback: Students have easy access to the marking in Moodle and therefore are likely to look at the feedback provided.
- Full information available when answering student questions: As the lecturer retains access to a copy of the student work and the marking student enquiries on marking can be answered based on full information being available without time delay or risk of tampering.

Despite these advantages a number of fundamental concerns still remain in regard to Moodle only marking:

- No integrated marker allocation: The allocation of markers to students has to occur outside Moodle. This means administrative overhead and more work in checking the progress of individual markers. If good practice is implemented, this has to happen outside Moodle and is time consuming.
- No integrated marking rubric: As Moodle does not have the concept of a marking rubric manual work outside Moodle is required. This leads to the risk of not using a rubric at all, to manual copy and paste steps, and to manual upload of external marking sheet documents, resulting in inefficiencies and risk of errors.
- Limitations in quality control: Moodle does not provide stages of marking that would allow the marking team to work on internal quality reviews before releasing marking to students. As a consequence, quality reviews either do not happen, have to be conducted under extra effort outside Moodle, or are attempted to be done in Moodle causing negative side-effects.
- Inefficiencies: If good marking practices, like marking rubrics and monitoring of quality are employed, many manual steps are required to compensate for the lack of functionality in Moodle.

The following quote shows how one participant describes the steps employed at their institution, working with a marking team and Moodle, supported by administration staff:

L2: "Its very labour intensive. What happens in the process is a student uploads to Moodle, our administration person [groups student work into] say 10, that gets emailed to the marker, the marker marks, they then return that to the administration person who then forwards that to me [...], then I do the quality control check, then it gets returned to the admin person who uploads it ..."

The following excerpt describes the difficulties another lecturer has experienced with using electronic submission supported by using a learning management system only. Many manual steps involved that cost time and carry the risk of making mistakes.

L15: "But all of those steps are somewhat error-prone, the downloading and the unpacking you want to have to make sure you actually navigate to the right student's assignment - with 200 odd assignments to mark they're identified only by ID number so that if you have got a whole folder full of ID numbers, no named folders it would be quite easy to navigate to the wrong one. And

you then have to mark the assignment and then give feedback and doing it manually is just error-prone and it's inconsistent and you have to produce reports.”

Marking team characteristics

The participants have conducted their marking discussed in different marking team constellations. These are outlined under this section of the report, as the characteristics of the marking teams are largely independent of the use of e-learning tools like Moodle or Lightwork. What changes with the use of technology are the efficiency in the collaboration of the marking team members and the uptake of opportunities for producing high quality marking. These changes are outlined in the later sections of this report.

The following are the tasks that are required for assignment assessment and marking:

- **Conceptual preparation:** This includes the design of the assignment task in relation to learning outcomes, the development of marking criteria, the writing of instructions to markers, the preparation of frequently-used comments, the decisions on what type of feedback (not linked to marking rubric, based on marking rubric, inline annotations) is to be given to students, and the forms of progress and quality monitoring to be employed.
- **Management:** This includes the handling of incoming student work, the allocation of students to markers, the distribution of student work and marking guidelines to markers, the monitoring of marking progress, the collection of marking from markers, the recording of marks, and the distribution of marking results to students.
- **Marking:** This involves working through the student submissions, deciding on a summative mark and providing formative feedback. It also includes for each marker to monitor for consistency within their own marking.
- **Quality review:** This means to check the quality of marking done by markers with regard to correctness, volume and quality of feedback, and consistency within and between markers.
- **Reconsiderations:** If students enquire about aspects of the marking or challenge the marking a review of the marking and responses to the students are required.
- **Post assignment analysis:** This involves deriving statistics, looking at weaknesses and strengths across the class, preparing feedback on class level, noting insights for future assignment tasks and related marking.

These tasks are distributed among the marking team members as follows:

- **Lecturer only:** The lecturer carries out all tasks by themselves. Steps related to the management of markers are not required.
- **Two lecturers:** The two lecturers work together on the tasks. There is some management effort required in distributing the marking between the two lecturers. In some case marking is divided on student basis with each lecturer marking the work of a student completely, in some cases the marking is divided by subtasks set in the assignment specification. The quality review becomes a peer review.

- Lecturer supported by markers: The lecturer carries out all tasks besides the marking, which is done by the markers. In most cases the lecturer will also do a limited amount of marking, to validate the marking instructions, to mark late submissions, or to deal with difficult to mark student work.
- Lecturer supported by tutor and markers: The lecturer does the steps of conceptual preparation, reconsiderations and post assignment analysis. The tutor takes care of the management. The task of quality review can be done either by the lecturer or the tutor. The markers do the marking, with some marking undertaking as well by both lecturer and tutor as outlined before. The exact division of work between lecturer and marker depends on the experience of the tutor, with the tutor possibly taking on more tasks otherwise assigned to the lecturer.

Example of Using ‘Moodle only’ Approach with a Large Class Size and a Large Marking Team

The following example is based on the steps that were undertaken for a class with 250 students and a marking team consisting of a lecturer, a tutor and five markers. Moodle was used for electronic submission, yet the marking rubric and the coordination of the marking team had to be undertaken outside of Moodle.

The lecturer set up the assignment in Moodle for electronic submission of student work. In a word processing document the lecturer prepared a marking rubric and in a separate document with instructions to markers. The tutor created a class list in a spreadsheet file and recorded the allocation of students to markers. The tutor distributed the spreadsheet file, the marking rubric and the instructions via email to the markers. Before the marking started the lecturer made the assignment specification in Moodle invisible to students to prevent students seeing marking before this was ready for release.

Based on the information in the spreadsheet the marker identified a student to be marked. The marker downloaded the student’s work from Moodle and opened it on their computer. The marker created a marking sheet by copying the marking rubric document and entering the student details of name and id number. After studying the student’s work the marker filled out the marking sheet, referring to the instructions provided. After adding up the marks given to each criterion in the marking sheet the marker transferred the total mark for the student into the spreadsheet. These steps required to have open in parallel Moodle, the spreadsheet program, the program required for the student’s work, the word processing program for the marking sheet and the instructions and a file system window for creating copies of the marking rubric.

At certain intervals or when prompted by the tutor the markers emailed their spreadsheet files back to the tutor for progress checking. The markers also uploaded their marking to Moodle. This required, for every student marked, locating the student in Moodle, opening the Moodle marking interface for the student, uploading the marking sheet file after carefully identifying the correct file on the marker’s computer and entering the overall mark in the Moodle interface. The tutor could then go into Moodle and look at the quality of the marking done by the marker and at comparisons between markers.

In the meantime late student submissions arrived via email with the lecturer. The lecturer confirmed to students that their work had arrived. The lecturer passed on the late submissions to

the tutor who in turn distributed the submissions to the markers after updating and redistributing the spreadsheet file.

Once all marking and checking was completed the lecturer made the assignment in Moodle again visible to students who now were able to see their marking results.

As these steps show, the lecturer and tutor in charge of the marking had put lots of effort into ensuring quality of marking. Yet, with using just what was provided by Moodle, conducting the approach was very inefficient. This is confirmed by participants who had marked both under the Moodle only approach and subsequently with Lightwork in their comments looking back on the Moodle only approach.

M2: "... most of the time [that] was spent on marking is actually admin work ..."

M4: "... it is definitely much better than what I did previously ..."

Effects of Lightwork Use on Efficiency

All Information in one Place

Lightwork presents all the information required for marking in one place. This was appreciated by participants.

M3: "... the same instructions have been pasted here so it's really useful rather [...] looking at the page and finding the instructions we can just scroll down ..."

L11: "...in was all there, all in one place to access and all in one place to mark, definitely much more time efficient."

L13: "I mean it sort of helps me to organise my marking process. And it saves me really time and a lot of energy ..."

It was also seen as an advantage for students to have assignment criteria, developed in Lightwork in form of the marking rubric and uploaded to Moodle by the lecturer, put closely with the assignment task and submission instead of removed in an admin guide.

L7: "...there are students who seem not to go back and look at what you have asked of them ..."

Providing the relevant information in the right place reduces student enquiries and therefore saves both students and lecturers time.

L11: "...I think that is excellent because the students are constantly asking those types of questions and being them able to access it for themselves without spending time talking to you."

Allocation of Markers and Monitoring Progress

Allocating student work to markers can be done easily and efficiently in Lightwork.

L15: "It did them automatically which was fine. It's nice not to have to go through and choose yourself."

Having marker allocation and the marking status for each student available allowed checking on progress of the markers.

L10: "...if something hasn't been marked it highlights it."

L15: "... it shows you the students allocated to a particular marker so it becomes clear whether a marker has basically not started yet, completely finished, mostly finished ..."

T1: "...we had one marker who didn't actually return her results by the due date and we were able to go in and see exactly where she was at ..."

As soon as markers have passed on their marking to the lecturer or tutor in charge this person can review the quality of the marking. More quality checking is likely to happen based on the ease with which this is possible.

L12: "...you can be a bit more proactive as a coordinator and go and say well look I notice you haven't started but we really do need to get it back."

Late assignments can be dealt with easily and workarounds used by some lecturers before in Moodle were no longer required.

L6: "The ability to easily deal with late assignments that you could very quickly allocate those to a marker ..."

Student Work and Marking Sheets Instantly Available

Lightwork downloads all student work assigned to a marker on demand. Should the downloaded files be compressed file collections Lightwork expands these files automatically. The marker accesses these files via a list of student names within Lightwork, which also gives access to the marking sheet for the students. Participants acknowledged that this is efficient and reduces the risks associated with selecting the wrong files.

Lightwork automatically creates copies of the marking rubric in form of a marking sheet for each student. This eliminates the need for manual copy-and-paste steps and is appreciated by the participants.

M4: "...you don't have to copy and paste a student name it's already there so that part is really good ..."

Providing Feedback

Most participants agreed that Lightwork encourages providing more feedback.

L10: "...you also give them more feedback ..."

L11: "...I think they ended up getting more feedback and probably more useful feedback."

The marking sheets provide a structure for marking. This makes it easier to be focused in one's marking and to note comments and marks as one goes along.

L12: "... it just it breaks down the task better, so that's why it is more efficient for me."

Frequently-used comments are very useful for providing valuable feedback efficiently. Basically all participants stated that these comments have to evolve with the marking as it is very difficult to foresee exactly which comments are required. Yet, once setup, the comments are very helpful for marking.

L3: "The efficiency in just being able to click on comments and get them zoom across to the other side and they're there so you know instead of typing them all out separately."

L14: "...when students kept making the same mistakes it was easy to just put a frequently-used comment so I didn't have to again keep typing."

T2: "...I love the facility of having frequently-used comments to me is an absolutely brilliant feature because I'm always writing on the students' things the same things ..."

Checking for Consistency

Checking for consistency of marking, either within a marker or between markers, can be done in various ways without the support of tools. Yet, using Lightwork increases efficiency in doing so.

L13: "I mean I can do that, I can do that non Lightwork as well but it's a lot more work that way whereas this cuts down your time in doing that."

Recording of Marks

By filling out a marking sheet for student marks are automatically recorded and added up to provide the overall mark. The transfer of marks from Lightwork to Moodle only requires one command from the lecturer. This is in contrast to approaches used by participants previously that required a manual transfer of marks.

L3: "...loading the grades at the end in Moodle took longer whereas in Lightwork that was more efficient too."

Lightwork facilitates the creating of a spreadsheet file with detailed and final marking results. This file can be used for upload of marks into institutional result processing systems. This feature was appreciated by participants.

Return of Marking to Students

Without using Lightwork marking feedback, created in a word processing program, has to be uploaded manually for each student.

M1: "...that was very time consuming where Lightwork wasn't you know once you'd actually done it, it was fantastic it was whoom and it was gone."

L10: [on working without Lightwork] "...it is easy to download and then mark but then uploading there is quite a lot of work because we have got to individually scan the marking scheme and we have to individually upload every file."

If the student work has been annotated directly the corresponding files have to be uploaded as well. This is a manual process without Lightwork.

L2: [on working without Lightwork] “It is quite excessive to have to upload two to three bits of feedback to each student.”

Lightwork simplifies the returning of marking to students.

T1: “... before we used to have to upload each individual mark sheet for each assignment that was marked. So we used to go into Stream and we used to then browse to locate a mark sheet that we had input information on and saved in that student’s name and then uploaded that and then saved that and then adjusted the mark as well. So that was quite time consuming and Lightwork completely removed the need to do all of that so that was huge.”

Effects of Lightwork Use on Quality

Careful Thought before Marking

Lightwork requires the setting up of a marking rubric before marking can start. Entering such rubric in a computer tool requires more precision than needed when just sketching out a rubric on a piece of paper.

L8: “And so it really is good to crystallize that and it forces you having to set up that rubric, it forces you rather than just go in and fly by the seat of your pants ...”

L5: “I’m not marking differently but I’m generating a lot more thought [...] before marking than during marking I guess.”

L13: “...enables a good preplanning how the marking is going to be set up ...”

Guidance and Consistency

There was strong support that marking with Lightwork improves consistency between markers. This is supported by the marking rubric, the frequently-used comments and the instructions to markers integrated into the marking rubric. All marking team members have access to the same information.

L4: “And also consistency, because if you have got a team of lecturers working together you’ve got a bank of comments you know the students are getting consistent comments across the whole number of them ...”

T2: “...have all the [markers] being able to use the same comments so there is some degree of consistency.”

Because Lightwork makes the structure underlying the marking explicit, both to markers and to students, consistency is improved. A lecturer talked about difficulties she previously had with getting a colleague to be more explicit in his marking.

L12: “...a lot of the marking is mental at the moment he can just give a mark and he tends to be more generous so the students don’t usually complain.”

The sections for instructions to markers that are integrated into the marking rubric make it easy for the lecturer to pass on detailed information to the markers. Should a new member join the teaching or marking team, information contained in the frequently-used comments would be very useful in ensuring consistency.

One lecturer expressed that using Lightwork has made her more explicit which fits in well with her understanding of accountability towards her markers.

L8: “The fact that you have to state what it is and its funny because I mean I have always done that, but probably more fudged, I think its made me, I think its made me more explicit.”

Using Lightwork has also an effect on consistency if there is just a single lecturer marking. One lecturer named several reasons for this. He was able to give the same attention to detail to all assignments as he could move faster than previously, based on the efficiency gains made through Lightwork. His marking was tighter as the concepts built into Lightwork provided more rigor. Other lecturers commented how easy it was to go back to previously marked work, adding as well that this was important if marking stretched over a longer period of time and one needed to check on the consistency between marking the first and last assignment.

L11: “... if I wasn’t sure whether I was being consistent in my marking it was also much easier to check amongst students what I had been doing to reassess that.”

L13: “... it gives you immediately a good view of how you have marked other students.”

Completeness, Volume and Quality of Feedback

The rubric structure, which is mirrored in the marking sheets created for each student, encourages markers to write comments in parallel to reading student work. This contributes to completeness of comments and to more detailed feedback on every aspect of the work.

M2: “...before I forget everything you know I can put it in place so by doing it that way we definitely can have more detailed explanation about where are the errors and where are the issues.”

Frequently-used comments are very helpful for markers whose first language is not English. Using the prepared comments reduces the number of errors contained in the feedback to students.

L8: “I had [...] New Zealand Chinese [marker] excellent student, really great but English isn’t his first language and so it was great for him just to click on that and he can modify them ...”

Frequently-used comments can contain extensive explanations that can be quickly inserted by markers. This leads to more formative feedback than will be given with comments that have to be typed for each student individually. This will help all students, but especially groups like international students.

L12: “...our international students need just a bit more explanation and just in simpler words so often your sentences are a lot longer to explain an idea ...”

Lightwork makes it easier to achieve a good level of feedback within the time limitations caused by large classes and desired turn-around times.

L6: “I think where we probably had the improvement is Lightwork is much better at encouraging the markers to put more comments so being able to use the frequently-used comments. Because one of the real challenges that we have is that we are trying to give students feedback [...] but we are also trying to do it under [...] incredible time pressure.”

One participant talked about individual differences in the effort markers are willing to put into giving feedback, with some being more thorough than others and the difficulty in controlling for that. She saw Lightwork as a possible help in addressing this, as it reduces the time pressures.

T2: "... and I wonder if on Lightwork you have those frequently-used comments that would sort of get rid of that to some degree because I worry that the reason sometimes if you get the markers that are doing slightly less feedback that is a time thing."

Some participants reported on providing more feedback as not everything has to be typed again as frequently-used comments can be inserted.

L14: "... when I was handwriting it I may circle the value [in question] and it wouldn't really mean any much more because I was marking so many you wouldn't necessarily write the same [comment again] ..."

The Lightwork user interface does not limit the amount of feedback given for a certain criteria, which has not been the case for all approaches used by participants previously.

M1: "Because the way we did it before we had basically just a limited area [...] but Lightwork doesn't limit me I can put as much as like in or as little as I like in that one."

A number of participants stated the need to modify frequently-used comments to precisely fulfil the feedback needs of individual students. This is possible in Lightwork.

T2: "... Lightwork also has the ability to personalise so I don't see a problem there either."

Lightwork provides the lecturer in charge with easy access to marking that has been completed by the markers. Lecturers appreciate this feature as it enables quality checking. This facilitates timely feedback to the markers, re-assuring them if they are on the right track or pointing them in the right direction if required.

L8: "... I can pop in and see easily locate the mark sheet which I did on a regular basis ..."

Structure of Feedback

Because of the rubric and marking sheet structure the comments given largely relate to specific criteria.

L11: "... last year the students got a grade and an overall comment but didn't get comments alongside individual aspects of the assignment whereas this year because Lightwork made that very easy to do ..."

A lecturer commented how having a rubric focused his marking much more.

L5: "... did make me much more focused on how we were going to allocate those marks."

Having the marking structured into criteria made the lecturers realize the importance of positive feedback. If giving feedback without the structure of a rubric it is easy to only focus on the negative aspects of the work. Coming across criteria for which a student was to receive full marks participants realized that a positive comment, describing why or how the task had been done well, was required. Several lecturers referred to adding to their frequently-used comments to capture positive feedback.

One lecturer expressed a further reason for positive comments. Should a student not receive full marks for a section of work, the positive comments would ensure the student that the marker had not missed the positive aspects of their work. This leads to more clarity for the students and less enquiries on marking the lecturer has to deal with.

L15: "... it's nice to get some feedback that the marker has looked at it and everything is okay rather than they have just given you a bulk mark and no reason."

Release of Marking by Lecturer

In Lightwork all marking is released to students by the lecturer or tutor in charge of the assignment. This allows the person in charge to perform quality checking and determine the point of time all students get access to their marking results.

L6: "... before to get them released you were relying on the markers to do it when they were ready [...], where this way you could do it, you could check it, send it out and all this was taken outside of Stream so you didn't have to worry about the students inadvertently seeing their mark."

A lecturer reported an experience from previous years were in a system preceding Lightwork marking had been released by marker at different points of time, which had caused problems with fairness.

L10: "And that created a huge amount of trouble, administratively and from student dissatisfaction so I think that probably is good having the control that the manager decides when everything is going to go."

Reviewing of Marking on Student Enquiry

The reviewing of marking in response to student enquiries is easier if markers use frequently-used comments as there is consistency in feedback.

L4: "Because then if students come back to query their grade you have some idea of what would have been said in that particular part of your feedback and marks."

With its definition of marking rubrics Lightwork encourages much more detailed recording of marking than many lecturers would do otherwise. This is seen as advantage in case there are enquiries about marking.

L5: "...that makes it a lot more objective in fact you know if somebody questions me or somebody asks me or challenges the marking you know [...] I'm much more confident using Lightwork than not."

Risk of Mistakes

Without using Lightwork many manual steps are required that carry risk of making mistakes. As Lightwork eliminates most of these manual steps it lowers the risk of making mistakes.

L6: "So not only I think are we getting more efficient but we [...] are less likely to make mistakes in terms of recording marks and making sure students assignments weren't getting missed and that kind of stuff."

T1: "... in Lightwork we knew it was the same mark that was in [Moodle] so we didn't have to go back and double check that both systems had the same results we knew they were the same and in the past we've had to go back and double check every single individual result."

Talking about marking in Moodle and its lack of a marking rubric or any other help in structuring marking a lecturer stated how hard it is to hold all marks for the different sections of an assignment in her head while marking. Looking at Lightwork she sees how the structure provided by marking rubric and sheets helps her to reduce cognitive load and risk of making mistakes.

L12: "And so there is a consistent framework because sometimes if your concentration slips [...] or someone interrupts you, you have to start marking the assignment again ..."

Student Satisfaction

The lecturers reported that they had very little enquiries from students on the marking undertaken with Lightwork. They interpreted this as good sign as they usually only hear when students are not satisfied with the marking.

T1: "...usually the feedback we get is not enough comments, not enough feedback, and I think we got minimal response to that this time, less than we would normally get and again I think that's because when a marker is marking it the comments are right there they've got no excuse but to put comments in there."

L6: "No news is good news."

L14: "They seemed to be quite happy that were getting a good level of feedback and that was easily accessible and legible."

L11: "...last year we got questions around would you please clarify why this happened and this year I think they seemed to feel much more comfortable with why we gave them the mark we did."

L10: "...they are appreciative of having got the marking back quickly."

Reflections on Assessment

Nearly all lecturers interviewed were experienced and had many years of teaching and marking practice. Despite this level of experience lecturers stated that using Lightwork encouraged them to review their practice:

L1: "... it makes you focus and think a bit more about the process you are currently using ..."

L7: "I think that it will encourage me to make that rubric more sophisticated than it has been."

L13: "...when I started using Lightwork I all of a sudden became aware of oh well okay I've been doing this for sometime now but maybe if I structured these things accordingly then that might help me a lot, ... that actually worked."

One lecturer reflected how she moved forward from her experience of marking the first assignment with Lightwork to the second of the same course.

L9: “The first one I found that I had actually sort of was repeating myself [...] marking the same thing twice more or less. So I cut it down to just 3 sections in the second essay and that sort of worked better, I sort of had to think a little bit more carefully about what I was marking in each [...] section.”

Based on the experience with Lightwork a lecturer thought ahead how she will be more specific in formulating the work requested from students, how marking has not necessarily closely reflected what was required from students and how it will be better to have requirements and feedback closely aligned.

L7: “... I might be more specific in the points that I’m requesting of them. You know we have had a list of bullet points but actually when they get it back perhaps the comments haven’t always been associated so closely with that bullet point that was in the admin guide which they are no longer looking at anyway. But if it’s up there on the same document they can see ...”

Having worked with Lightwork made a lecturer realise that there could be advantages working out the marking details while structuring the assignment tasks.

L5: “... I could think about the way that the assignment is structured and moved it, put those two things together and I think there would be some efficiencies in there.”

Using Lightwork had the effect of thinking beyond the current assignment to assessment and course design.

L11: “And that’s made me actually very interested in the idea of whether our assessment is appropriate assessment and just thinking more about the course in general.”

Considerations around Paper-based and Electronically-Supported Marking

Speed of Submission and Return

Posting work in paper form, especially from overseas, takes considerable time. It means that students have to submit their work well before the assignment deadline. After marking is finished similar delays occur for posting feedback to students. These delays are annoying for individual students and create inequalities between students. Electronic assignment submission removes these delays and related inequalities. Students appreciate electronic assignment submission and marking.

L6: “...once we introduced [...] online assignment submission there was no going back, students appreciate it ...”

Use of Multiple Media Formats

Electronic submission allows dealing with non-text formats of student work. For example, recordings of student presentations can be made and marked after the event.

L13: “...we let them know that this will be recorded and the teachers will mark them separately.”

Electronic submission is essential if the student artefacts have to be executed, as it is the case with computer programs or spreadsheets containing calculations and macros.

Keeping Track

Paper submission and marking requires more manual effort to keep track of student submissions and marking than electronic submission and marking.

L9: "...you don't have to worry about having bits of paper and that sort of thing, its tidy."

L10: "...unlike a paper thing it doesn't go missing ..."

Electronic submission allows students to see that their work has arrived.

L10: ... online submission is much, much better than paper submission, just because of control and also you know people post and it may not get there whereas it is very clear when they have posted."

A lecturer who has specific requirements for allocating students to markers and therefore could not rely on central support services stated:

L7: "So that means for me its always been a matter of physically handling the file, physically going and putting it in a courier bag, physically sending it off, all that kind of stuff. And it's just wonderful to just do it all on the computer."

A lecturer who encourages students to attach articles researched to their assignments found this much easier to manage with electronic submission, both for himself and for the students.

Reading on Paper or on Screen

Several participants expressed finding it difficult to read student work on-screen. Most talk about 'on-screen marking' but closer questioning reveals that they only refer to reading student work on-screen. No-one has expressed problems with reading the information provided by Lightwork on-screen or with typing their comments on the computer. Despite voicing their concerns about reading on-screen the participants welcome electronic assignment submission and clearly see the advantages outweighing the problems. One participant who expressed concerns about reading student work on-screen has recognized how she can improve her ergonomic setup and behavior. One lecturer printed the electronically submitted student work to avoid having to read from screen. She still was able to use Lightwork for her marking.

On the other hand, several participants expressed their preference in reading from screen instead of paper.

L14: "...it also made it easier to read the assignments rather than having to flick through pages and go back and forwards ..."

L13: "Oh not at all, I prefer reading from the screen."

One participant appreciates not having to switch between paper and screen, allowing her to work without glasses she has to wear when reading from paper but not from screen.

Direct Annotation of Student Work

In the traditional way of marking student work presented on paper the marker writes annotations directly into the student work. The assumption that students appreciate these comments was voiced.

Some participants put comments directly into student work in the electronic format, by using features such as track changes or comments. One participant expressed the thought that she would be giving more meaningful feedback on paper copy than on electronic copy. At the same time she stated that she can type faster than handwrite and the advantage for students will be in legibility.

Lightwork facilitates this work by automatically uploading the appropriate annotated files to students. The new version of Lightwork goes one step further. It offers inbuilt annotation facilities that have the advantage of linking the inline annotations with the criteria of the marking rubric.

Annotating student work directly is time consuming, regardless if it is done by hand or assisted by electronic tools. Discussion has to take place to which level direct annotation should and can be provided given time and budget restraints. Further research has to investigate if there is a quality advantage in handwritten comments, and if so, what needs to be done in electronic tools to replicate this.

Overall lecturers expressed the view that students are getting used to the online medium, to Moodle and to receiving feedback in electronic form. The lecturers see Lightwork as an innovative tool that fits into this changing world.

Marking at Multiple Locations

Several participants mentioned that they like to mark at different locations. One participant named it as an advantage of paper being able to take assignments with her when marking. In contrast to that another participant named it as particular strength of Lightwork to be able to mark at different locations. This participant has a mobile computer and sees it as being much easier to take marking with him, as he does not have to carry the student work on paper, has access to the work and marking of all students, and has access to all information required for marking, such as the rubric and extra notes.

L14: "I marked on my laptop and that meant I could mark pretty much wherever I went as opposed to then having to say well okay I'll take 10 assignments home as paper if I get through 10 quickly great job is done whereas it meant I could take all of them and I could mark as many as I needed to wherever I wanted so it made it a lot more time efficient."

A further marker worked at the office and at home and appreciated that Lightwork enabled this.

Conceptual Assessment Issues Arising

How to Structure a Marking Rubric

Structuring a marking rubric requires lots of thought. It is best done in conjunction of designing the assignment task, with the rubric structure following the structure of the assignment. Structuring a marking rubric is a challenging task.

T2: "...that it was quite challenging to try and work out okay what is really important in this assignment?"

If one uses many criteria there is the danger of overlap making it difficult to associate comments with the right criterion. If one uses few criteria each criterion can cover too much of the overall task, providing not enough focus. Even experienced lecturers face this challenge.

L8: "I found it difficult to be clear in the criteria. I think I will get better at it."

The tension lies in not wanting to restrict too much while still having enough structure for marking. In the context of student design work one participant made the following comment:

L4: "... there is so much creativity in that way of working and you don't want to mark against that but you also need to have some criteria that you can mark with ..."

It is difficult or even impossible to develop a perfect marking rubric. Marking rubrics are always evolving and need improvement all the time.

One issue that was brought up by several lectures was about the challenge of developing marking rubrics for certain types of assignments. For student tasks that are on higher conceptual levels or provide students with freedom for subject choice or creativity, lecturers expressed doubt that it was possible to define a marking rubric. The lecturers felt that a marking rubric would tie down the marking too much and would be too restrictive. The lecturers stated that they would have guidelines or criteria agreed among the marking team, with the students not necessarily seeing the details. In these cases marking is communicated to students via constructive feedback and quality assurance is achieved via moderation.

Another potential difficulty with having a tightly specified marking rubric was identified around student work presenting solutions quite differently from what was expected. For these pieces of work it can be difficult to provide feedback and marks within the structure provided by the marking rubric.

L15: "...every now and again you do get solutions where people do things in an unusual way and your predefined criteria don't fit."

The lecturer also added the concern that markers could apply the marking criteria too literally as they might be lacking confidence and knowledge of the overall goals of the assignment.

There is certainly a tension between making the marking transparent and leaving flexibility. This tension arises on two levels, between the lecturer in charge of an assignment and their marking team, and between the marking team and the students. More research will be required to explore this issue. Lightwork can be applied with any structure of marking rubric as it does not dictate how explicit or fine-grained a marking rubric has to be. In the extreme case a rubric could exist of one sole criterion covering the assignment in its entirety.

Communication of Quality Criteria

In the contexts of discussions on quality of marking and marking rubrics a few participants talked about experienced markers being able to judge the level of quality of student work, even without these quality criteria being explicitly defined. Being asked how this understanding of quality criteria is communicated to students a participant responded:

L2: "But I think you are right, I don't think the students explicitly have an understanding of what it means."

This raises the question if it is possible to assess student work fairly without explicitly stated quality criteria and how quality criteria are communicated to students.

Need for Constant Improvement

An issue raised by several participants concerned the use of frequently-used comments. It was expressed that these comments will not fit one hundred percent in all circumstances. Markers need to be able to adjust these comments to best address particular student work. It was acknowledged that this is possible in Lightwork.

There was some discussion on who should be allowed to modify the frequently-used comments. In Lightwork this can currently only be done by the lecturer or tutor in charge of the assignment. Markers can suggest changes to the comments but rely on the lecturer or tutor to make these changes. The rationale behind this design was to ensure the quality of the frequently-used comments and to prevent creating a collection of multiple, differently formulated comments with the same meaning. This approach can hold the markers back if they do not get a quick response from the lecturer or tutor. This situation can possibly be addressed with lifting the status of a senior marker to allow editing.

L10: "... the markers don't have the ability to add frequent comments and so either they have to ask me to add the frequent comments or they rely on the ones I have already put in there. That to me would be one of the most inefficient things that I think that I found ..."

Some lecturers thought ahead if it might be possible to re-use frequently-used comments for equivalent assignments in following years. While assignment tasks are modified concepts taught remain largely consistent. This question presents an interesting starting point for reflections on the focus of feedback given to students, which can be more on the concrete assignment task context or on the underlying concepts.

Showing Grades or Marks to Students

Lightwork displays numeric marks to students. It provides an overall mark and individual marks for each criterion defined in the marking rubric. Several lecturers expressed that they would prefer if only overall grades would be shown to students and not marks. Two arguments were provided for this. The lecturers find that it is more meaningful to label certain work, like an essay, with a grade to express the level achieved by the student. They think that a 'B+' means more to the student than receiving a number like 73.

L8: "...I really don't think philosophically essays should be given a mark."

Related to this is the opinion that if work has received a grade there should not be any finer distinctions communicated to students, as expressed by a mark of 73 compared to 74. The other argument relates to marks for the individual sections. Some lecturers think that such sub-marks should not be shown to students. Sub-marks might give a negative message to a student if, for example, they have only been given 2 out of 5 possible marks for a section, and might distract from the overall grade. In addition, sub-marks open the door for students to argue about single marks.

Yet, the majority of lecturers interviewed did not express these concerns. These lecturers had no issues with providing students with numeric marks and sub-marks. The lecturers welcomed the degree of transparency provided to students. The difference in opinion seems to be related to discipline areas and

as well to the types of assignment tasks. Research will be required to find out which option might be educationally sound in which circumstances. In addition, institutional policies will play a role, with some institutions now insisting on seeing marks for individual assessment components. A further factor is that students prefer consistency. As one lecturer reported, students requested to be given detailed marks and not just grades for all assignments in a course once this was done for one assignment.

On a deeper level this discussion is linked to how best to construct marking rubrics. The question is if the marker still uses mark allocations to criteria to arrive at the mark and therefore the grade for a student. This would ensure consistency in marking, even if the details were not communicated to students.

On a technical level, Lightwork could be extended to provide the option of not displaying marks to students. Together with settings in Moodle this would mean that the overall mark would be recorded but students would only see a grade.

Opportunities for Sharing

One opportunity seen by several participants is that using Lightwork might increase sharing around assessment practices among teaching teams and on a wider level among departments. Lightwork brings assessment practices more out in the open by the definition of rubrics, instructions to markers and frequently-used comments. While many have used these elements of assignment marking before, using them within Lightwork encourages more detailed specification which in turn prompts reflection and enables dialog. This has been seen as being of advantage within marking teams and between colleagues working together.

One lecturer expressed the need to discuss first year internal assessment across his college to see if some unifying guidelines should be created. Currently, there are courses that only use multiple choice tests while others ask the students to write several essays or reports.

Transparency of Marking

Lightwork mirrors the roles of lecturer, as the person responsible for an assignment, and markers. The way this is done has overall worked well in supporting the participants and their marking team structures. A few participants have questioned a particular aspect of the boundaries between lecturers and markers in Lightwork. A lecturer who carries out the management and oversight tasks in Lightwork can also mark student work. Yet, to do so, the lecturer first has to assign this student to themselves for marking. In particular, if a student has been assigned to a marker, the lecturer needs to first re-assign this student to themselves before being able to edit the marking done by the marker. The thinking behind this aspect of Lightwork is based on accountability. Marking is released stating the name of the marker. Therefore, any editing of marking moves the accountability from the original marker to the new marker. To achieve this, marking has to be re-assigned. A few participants stated that this re-allocation was an unnecessary step and wanted to be able to edit straight away.

L15: "I wanted to be able to just take over an assignment without having to go and post myself as the marker and then change the marking status to be in marking ..."

Another participant voiced the opinion that the names of the markers should not be given to students at all, as the responsibility lies with the lecturer in charge and as student enquiries should be directed to the lecturer.

A related issue centers on the transparency of marking within the marking team. Currently in Lightwork, only the lecturer or tutor in charge can see the marking done by the markers. Markers cannot see each other's marking. One tutor expressed that she would like everyone to see everyone's marking. A marker mentioned wanting to check with fellow markers before passing on his marking work to the lecturer in charge.

These issues were only discussed with some participants. Further investigations will be necessary to resolve how these transparency issues should be handled.

Marking Rubric Descriptions and Feedback to Students

The concept in Lightwork is that the lecturer can create a PDF version of the marking rubric and can upload this document, at any time, to Moodle. Students will find this document where the assignment is specified. After the marking each student receives a copy of their personal marking sheet. Currently, the personal marking sheet does not contain the detailed rubric descriptions. The idea is that students look at both documents in conjunction. In earlier software both documents were combined, which caused some confusion with students in failing to distinguish between general descriptions and maximum available marks and individual feedback and individual marks. It has to be discussed which approach is better.

Considerations on Future Lightwork Features

A number of new features or modifications to existing features have been suggested by the participants. Named here are the features that have not already been implemented in Lightwork Version 2. Some areas that require exploration on the best solution from an educational point of view have been mentioned in the previous section under conceptual assessment issues.

One lecturer would like to print marking sheets before release of marking to Moodle. The lecturer's argument was that it would be easier to check on the consistency of per criterion comments and summary comments if the marking sheet was printed. Current Lightwork thinking is to implement such feature by making the PDF version of the marking sheet available before release to Moodle. This can then be viewed on-screen or printed if desired.

For one lecturer the font size used by Lightwork is too small, making it difficult to read. Lightwork should provide user definable settings for font size.

Currently the frequently-used comments are displayed in truncated form in the marking interface to save screen real estate. If the frequently-used comments are long this truncated display makes it difficult to pick the correct comment. Lightwork should make the display more flexible to cater for a larger variety of user requirements.

Every marking sheet in Lightwork contains a section for a summary comment. Currently this section is placed first, before the listing of the assignment specific criteria. Two participants expressed that the summary section conceptually should come after the criteria sections. Lightwork could be modified to provide both options of placement.

Issues around Starting to Use Lightwork

Setup Issues

Several participants had from difficulties with setting up Lightwork. The main issue had to do with the earlier mentioned decision making delays in installing Lightwork into the Moodle installations of their institutions. A secondary issue had related to shortcomings in the very early versions of Lightwork, which caused performance problems and faults when copy-and-pasting text from word processing documents containing certain special characters. Despite these issues the participants persevered with exploring and using Lightwork. The issues caused by Lightwork itself have been overcome in the meantime. Integration of Lightwork into institutional Moodle installations have to be completed before future Lightwork use. The issues encountered in this regard were not of technical but institutional decision making nature.

Performance Issues

Some participants commented on the time it took to download student work with Lightwork. One participant stated that, working just with Moodle, she would not download student work but just open it. This shows some misconception, as any student work that has to be opened by the marker with an application like a word processing or spreadsheet program has to be downloaded onto the local computer first. This is required both with Moodle and Lightwork. One difference with Lightwork is that all student work assigned to a marker is downloaded in one step. This removes the need for waiting for downloads when switching between student work and also makes it possible to mark without network connection.

Lightwork performance has been improved considerably since the early version used by the participants. Mainly the users with large class sizes will notice this improvement.

Familiarization with Lightwork

As with any new software, users had to become familiar with the features of the new system first. The participants in this study had no major issues with learning to use Lightwork. Yet, several users missed out on some Lightwork functionality as they did not realize that certain features were available. Some markers expressed that they initially were unsure about how certain features worked but that they developed confidence quickly.

M4: "But I like it overall it's just a matter of you know getting used to the system ..."

The participant were the first ever users of Lightwork. This meant that the lecturers and tutors leading the marking teams were equally new to Lightwork as the markers. Experience with using Lightwork will develop quickly and will address these issues. Despite Lightwork being very new software in its first use, participants had little problems operating the software and no issues understanding its concepts.

The learning curve with using Lightwork lies less in knowing how to operate the software but more in how to setup marking concepts effectively. The following example is from a lecturer who talks about her experiences in formulating frequently-used comments.

L9: "I thought what I put in there was sensible but when it actually came to using them they weren't particularly. I think what I did was I made the statements too long and [...] perhaps I put two things in one statement and so therefore it didn't necessarily apply. I think I'd keep them shorter and just apply one thing ..."

What many participants expressed was the need for working on how to best implement the marking concepts Lightwork exposes. This includes the setting up of marking rubrics, the writing of instructions to markers and the collection of frequently-used comments. The participants realized this as a good opportunity to improve on their marking practices.

Support Requirements

One lecturer, teaching courses on the lower levels of the tertiary sector, mentioned that some students have very limited technical ability. For some of these students even using word processing software is new. These students have to be taught how to submit assignments online. None of the other interviewees reported on students having issues or learning needs with using electronic tools or online submission. A lecturer who has worked with electronic submission for several years reported that students have less and less problems with this type of submission.

Lightwork was very new software when the participants agreed to use it for their assignments. Some of the participants moved directly from paper based assignment submission to use of Moodle and Lightwork. Support was provided by local contacts within the institutions. Several participants commented on the importance of having good support.

T1: "... the worst thing you can do with any new technology is to not have the support people there because then we just throw our hands up in the air and go oh its too hard."

T2: "... we felt from our perspective that we didn't want to try new software without the support of people in case anything went wrong."

Willingness to Move Forward

Lightwork requires the use of Moodle to handle electronic assignment submission and return of marking results to students. Lightwork has been designed to take full advantage of features already included in Moodle. Many lecturers do not yet use electronic assignment submission and misinformation on the level of difficulty in doing so seems to be around. This was indicated by a participant who made the transition from paper submission to using Moodle and Lightwork in one step.

L7: "...somebody suggested that even having submission of assignments on Moodle was going to be complex, I'm not quite sure why."

There is a perception that many academics show a reluctance to move forward in accepting e-learning tools, even if these tools would actually reduce workload.

L14: "I've tried to promote it, that is to get as many people to use marking online but I think there are one or two people within our department that are a bit old fashioned and they're not necessarily the older academics ..."

L10: "... I don't have any authority to make [...] staff take an interest so but from an [distance student] point of view I think its really, really essential almost to have something like Lightwork because online submission is really the only way."

A lecturer who has used electronic assignment submission with Moodle before points out the need for the right toolset, which she sees being provided by Lightwork.

L12: "I think that a lot of those teachers would be much happier to mark online with Lightwork support. I think the difficulties of marking online are that you have to have a lot held in your head and you can't sort of scribble in the margins so easily on a document and have it returned to the student. And I think Lightwork would make it much easier."

A participant, whose marking team had moved forward from paper to electronic assignment submission and marking, comments on her surprise to the degree with which her team accepted the change.

T2: "...I didn't know how they would react to that and they loved it, I was really surprised, all of them were like now this is so much faster, this is easy, they were really happy."

On reflecting on the current marking practices in his department a lecturer saw that advantages could be gained by using a marking approach as represented by Lightwork.

L5: "I can see that that this type of would be quite useful for some of our first and second level papers where there is a lot of assessment and there is a lot of small assessments."

A lecturer, who earlier expressed how Lightwork had impacted on his own marking, recognised that e-learning tools by themselves cannot improve marking but that success will always depend on the person using the tools.

L13: "So you know from that perspective looking at it overall I'd say that it probably is not a blanket statement that Lightwork will make feedback better, it totally depends on who is doing the feedback."

The same lecturer also commented on the positive effect e-learning tools can have in triggering thinking.

L13: "Literally what happened I mean sometimes software endues peoples thinking."

Comments Summarizing the Contributions of Lightwork

Lightwork provides efficient support for good marking approaches already practiced.

L2: "It is a lot of the practices we do already; it is just consolidated so it talks back to that efficiency and to maintaining consistent quality between different markers because you have a central place that everybody can access as opposed to me providing feedback to each individual."

For experienced lecturers who already have a good understanding of assessment practices, Lightwork provides the opportunity to implement such practices.

L6: "... maybe not increasing knowledge so much but actually increasing your ability to apply the knowledge ..."

L14: "... I feel it has enhanced the ability to mark more efficiently so therefore [...] marking has become less of a drag than it might have been ..."

Lightwork can be a catalyst for reviewing and changing assessment practices.

T2: "... even the meeting, the initial meeting about what it did as I said basically made me change entirely what we were doing ..."

As a concluding comments on Lightwork participants stated:

L6: "... we have now got a tool to be able to both mark and manage 300, 400, 500 assignments, so well done."

L8: "I think it's a great tool for multiple markers and for large classes ..."

L14: "... I'd definitely use it again if it's available which I hope it is ..."

L12: "I think it's a fantastic piece of software ..."

L15: "... I would hate to actually handle a large class without it or [the predecessor system for Lightwork] last year, doing it manually is just a lot of work, it is very error prone and this gets rid of that."

Conclusions

Based on the experiences of the 22 evaluation study participants who have used Lightwork for assignment marking in tertiary contexts one can strongly conclude that Lightwork has the potential for positive impact on efficiency and quality of assignment marking.

The education literature provides a clear picture of what constitutes good practice in assignment marking. It also emphasizes the importance of assessment and formative feedback for student learning. Participants have reported clear efficiency and quality gains from using Lightwork as compared to either working with paper only approaches or with electronic approaches relying on Moodle only. They state that Lightwork makes it feasible to apply good assignment marking practices, even under the pressures of large class sizes and short timeframes.

The evaluation has shown that Lightwork encourages reflection on assessment approaches. It brings thinking around assessment out into the open and facilitates sharing and discussion, both within marking teams and wider teaching contexts. Considering the importance of assessment for student learning and the lack of transparency related to many current marking approaches Lightwork has the potential to be an important catalyst for improvements.

Participants strongly agree with the concepts built into Lightwork and had little difficulty in operating the software. The challenges in using Lightwork arise from being confronted with the need to clearly structure one's marking in an open and transparent way. This challenge was welcomed by the participants as they see this leading to assignment marking that will be more consistent and will better contribute to student learning. As for any new e-learning solution, participants ask that their institutions provide readily available support.

The responses of the participants have highlighted several areas related to assignment marking where there is uncertainty about how to implement assessment theory in practice. Further investigation will be required to develop recommendations in these areas.

Appendix A: Interview questions

Assignment context

What was the subject area of the assignment?

How many students were in the course?

What was the level of the course?

What type of work did the students submit (essay, report, calculation, ...)?

How many files of what file types did the students submit?

Did students submit in groups?

If yes, how many submitted together?

If yes, did all team members receive the same mark and feedback?

Marking context

Did you mark by yourself?

Did you have a marking team?

If yes, how was this team composed? (markers, admin staff, ...)

Did you/your markers annotate student work directly?

If yes, in which program did you do this? (Word track changes, PDF annotation, ...)

Efficiency of marking

Do you find that using Lightwork has helped with the efficiency of the assignment marking?

If yes, in which ways?

Quality of marking

Do you find that using Lightwork has helped with the quality of the assignment marking?

If yes, in which ways?

Feedback from marking team members (if applicable)

Have you had any feedback from your marking team members on marking with Lightwork?

If yes, what kind of feedback?

Feedback from students

Have you had any feedback from your students in regard to the assignment marking?

If yes, what kind of feedback?

Knowledge about assessment

Has working with Lightwork had an effect on your knowledge about assessment?

If yes, what kind?

Closing

Would you provide us with a copy of your marking rubric?

Could I have a copy of your comments to markers and your frequently used comments?

Would you allow me to publish your marking rubric in a document/website to help others with the development of marking rubrics?

Why did you structure or write your marking rubric in this way?

What worked well about it?

What did not work so well?

What would you change for next time?

Would you provide us with some examples of marking sheets and annotated student work?

Do you have any comments?

Appendix B: References for the Background from the Literature Section

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