

I-LAB as a New Tool on Laboratory Report Writing in The 21st Century

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ABSTRACT

Certain programs offered in Institutional Higher Learning (IHL) offer courses that include lecture in class and laboratory activities. During the laboratory activities, students are required to work in groups of maximum four members and perform the laboratory activities following the correct procedures by referring to the laboratory manual given by the lecturer at the beginning of the class. Students are expected to write a laboratory report after completing the procedures that include analysis and interpretation of data, discussion of result and conclusion. The typical practice of producing the laboratory report is that students have to type and print the report for submission. Sometimes the process takes longer period due to time constraints. Therefore, I-LAB is introduced to simplify the process of report writing. I-LAB is a computer programme developed using Microsoft Excel where students can refer the laboratory manual and write their laboratory report using this programme. Additionally, the objectives of this programme are to reduce the time taken to finish the report and also reduce paper usage. The programme is expected to ease both parties; students' and lecturers' works. On students part, the report writing and submission, and on the lecturers part, the observation and checking on the student's works.

Key Words: civil engineering, OEL, laboratory report, e-submission, I-LAB.

1. INTRODUCTION

As per requirement for Engineering Technology Accreditation Council (ETAC) for engineering programs in Malaysia, technical report should be explicitly assessed for the laboratory courses as stated in the program structure. Parallel with education revolution that needs to suit society 5.0, the medium of preparing report and submitting the report should be aligned with the digital generation expectation nowadays. Traditionally, technical report from laboratory will be prepared using Microsoft Word or any equivalent word processing software available. The process of preparing the technical report involves retyping the instruction of the lecturer until to the last item in the report. The process of retyping is time consuming and considered as repetitive action which does not lead to any contribution of cognitive and psychomotor domain assessment. After completing the report, students should submit it in hard copy form to the respective lecturer to be assessed. However, this practice is viewed to be no longer valid for society 5.0, which demands for high technology and full access at any medium on internet. From their perspective, report writing should be easily doable at the end of the fingertips and can be done everywhere. Moving forward for sustainable engineering education, printing the report is worthless to the lecturers and students themselves. Students will be burdened with the cost of printing and lecturers need larger storage area to keep all the report. In addition, there are cases where the report is missing during submission process, and lecturers are also having a hard time to keep track of the actual time of submission.

Therefore, something should be done in overcoming the problem by creating a new teaching tool that provides student a convenient medium to prepare the report with online submission system which is traceable by both parties. Thus, I-LAB is created in order to help student in preparing the report. Submission of the report from I-LAB can be done using i-Learn. For the initial step, I-LAB is developed for one course for the pilot study and hopefully can be applied to all laboratory engineering courses specifically in Diploma of Civil Engineering in the future. The detail of I-LAB execution is discussed in the next section.

The main objectives of I-LAB creation as a teaching tool are to:

- a) Reduce the time required for preparing the laboratory report
- b) Trace the submission with ease
- c) Eliminate the needs for printing
- d) Reduce storage space for keeping the report

2. LITERATURE REVIEW

Open ended laboratory (OEL) is a laboratory teaching and learning method which is not fully guided as compared to traditional method of teaching and learning. Fully guided laboratory will not fully expose students with the learning outcomes needed on laboratory courses.

The Engineering Technician Education Programme Accreditation Standard Manual (ETAC) 2019 specified that:

“Students should be able to practice engineering skills to complement engineering theory that is learnt through lectures. Practice-oriented learning experiences should engage students with the use of facilities, equipment and instrumentation reflective of current industry practice which will help in developing competence in executing applied and experimental work.” ETAC Manual 2019, page 15

Through open ended-laboratory students develop the competence in executing and applying experimental work. Students will propose the procedures and the data needed to analyse in order to achieve the objectives of the laboratory work depending on the level of openness.

Traditional laboratory report submission requires students to submit the report in hardcopy form to the lecturers within the timeframe given. This leads to several difficulties to students and lecturers.

In certain programs offered in Universiti Teknologi MARA such as Diploma in Civil Engineering, the ID Plan is filled with courses that include lecture in class and also laboratory activities. During the laboratory activities, students are required to work in groups of four members and perform the laboratory activities. The methodology used in the laboratory is related to the corresponding theoretical subjects, (Lopez et al., 2016). The laboratory activities are conducted by following the correct procedures and referring to the laboratory manual provided by the lecturer at the beginning of the class.

The laboratory report consists of several main criteria for students to fulfil in order to complete their report. When students take several laboratory courses in the same semester, they will use non face-to-face learning time to complete the reports. On this situation, students have tendency to lack of focus on the other non-laboratory courses. Besides that, the hardcopy report submission also will impact the students in terms of cost, and it will be even more costly for those taking more than one laboratory course in the same semester.

Futhermore, lecturers also face difficulties in traditional submission of reports from students. The lecturers may lose track in the case of late submission.. Students tend to forget and could not manage their time to complete their laboratory reports within the time as several laboratory reports deadline due on the same time (Gregory & Garcia, 2015). As the lecturers need to mark the report and provide feedback to the students one week after the submission date, it is important for the students to submit their report on time.

Therefore, in order to align delivering OEL in the 21st century, the submission method should be changed to other methods. The other method to submit laboratory reports suitable in the current time is

by e-submission. E-submission enables students to submit their laboratory reports through digital platforms.

This study focuses on the laboratory report e-submission in OEL compared to traditional submission methods in this digital era. By e-submission of laboratory reports, students may focus on executing and applying experimental work to achieve the objectives rather than use much time to complete and print the reports. Besides that, the submission will be traceable through digital platforms and it will be easy for the lecturers to mark the reports based on the specific criteria. Nowadays students more alert with digital learning concept. Students who are assessment-driven, need to be consistent with the current environment (Kember et al., 2009).

3. METHODOLOGY

3.1 I-LAB

I-LAB is a computer programme where students can refer to the laboratory manual and write their laboratory report. I-LAB is developed using Microsoft Excel software which includes the entire framework of laboratory report starting from the front page, objectives, hypothesis, ways and means, findings, analysis, and conclusions.

3.2 How I-LAB works

During the laboratory activities, students are required to work in groups of four, and perform the laboratory activities following the correct procedures by referring to laboratory manual given by the lecturer at the beginning of the semester. Students are expected to complete a laboratory report after completing the procedures that includes analysis and interpretation of data, discussion of result, and conclusion. The typical practice of producing the laboratory report is that students have to type and print it for submission. Therefore, I-LAB is introduced to simplify the process of report writing.

During the laboratory activities, students can read all the information regarding the laboratory including objectives, procedures, theoretical background and others using their handphone, tablet or any gadget without needing to print the laboratory manual. Figure 1 shows the front page interface of I-LAB.

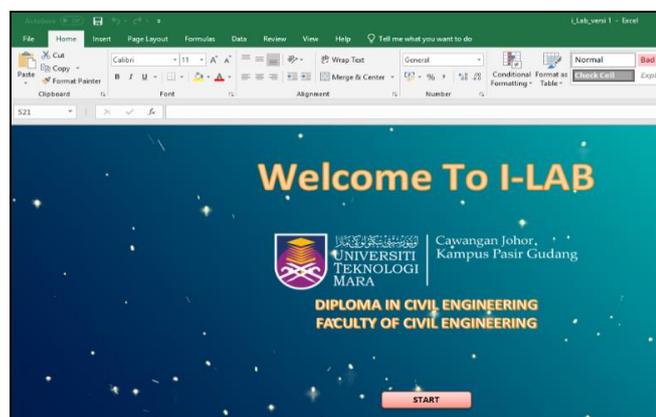


Figure 1: Front page of I-LAB

Table 1: Procedure using I-LAB

NO.	PROCEDURES
1	To start using this programme, just click the 'START' button.
2	Next, students have to fill in their information including group members' names and student id, . Next, click 'TAKE A TEST' button. This interface will show what elements to be assessed from the laboratory report.
3	After that, list of laboratory test will appear. Students have to choose which laboratory activity they want to perform.
4	The interface will show the laboratory manual for the chosen experiment. To start performing the experiment and complete the report, students have to click 'ANSWER SHEET' button.
5	Using this interface, students can record all the data and results from the experiment and also complete the discussion and conclusion regarding the results gained from the experiment. After finishing all the required information, student can click 'FINISH' button to save the report in pdf format

This whole process as shown in Table 1 can reduce the time required to prepare the report as students can write the report in the laboratory itself. This programme is suitable for all laboratory courses because it is user-friendly.

Students will then upload the complete laboratory report in i-Learn. The completed laboratory report as shown in Figure 2 with result analysis, discussion and conclusion are filled by students in group. By online submission, lecturers can observe the submission time and penalize late submissions. During the final stage, lecturers will download the laboratory report, read and award marks accordingly.

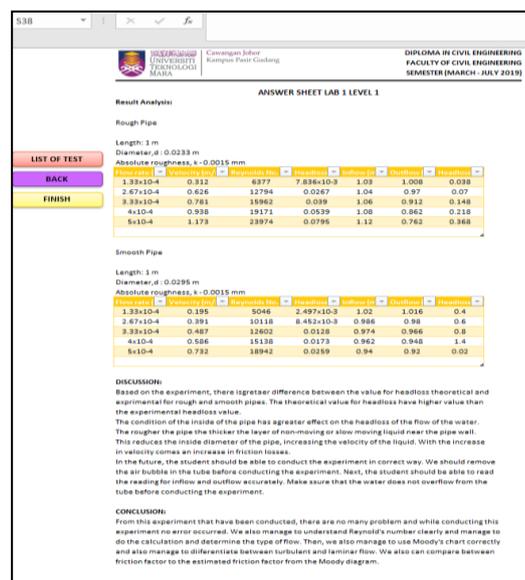


Figure 2: Completed laboratory report generated from I-LAB

4. DISCUSSION

Basically, laboratory reports are documents which are written to explain the procedures that include analysis and interpretation of data, discussion of results and conclusions, description and analysis of a laboratory experiments which investigate a scientific concept. Students are expected to complete a laboratory report upon completion. The typical practice of producing the laboratory report is that students need to type and print it for submission. Sometimes the process takes a longer period due to time constraints.

Therefore, I-LAB is introduced to simplify the process of report writing. I-LAB is a computer programme developed using Microsoft Excel software where students can refer to the laboratory manual and write their laboratory report using this programme. Microsoft Excel is easy to use and very user-friendly because it is very familiar to the student, hence making the I-LAB programme easy to understand and use with the aid of simple instructions.

By using this programme, it is expected that the time taken to finish the report can be reduced. Students can start writing their report instantly after doing the laboratory experiment in class and submit it before the end of the class session. Additionally, students can do their group discussion in the class instead of setting an arrangement to have a discussion session after class. This sometimes take a longer time affect the whole process of completing the report. By completing the reports together in the class, lecturer can monitor and observe the involvement of all members in the group in completing the report. It can potentially improve the ability of students to manage time and organize their work to complete the report.

Normally, after completing the report, students will need to print the report before submitting it to the lecturer and this will involve cost. By using this program, students will no longer need to print the report and it can simply be sent by clicking the submit button in the program menu. This program can reduce paper usage, hence saving cost. In conclusion, the programme is expected to ease both students' and lecturers' work. On the student's part, it eases the financial and time factors, in report writing and submission, while on the lecturer's part, the ease of observation and marking of the students' work is achieved.

5. CONCLUSION AND RECOMMENDATION

Computer-based technology is undoubtedly ubiquitous, and it surrounds us in so many aspects. All elements in life of the future will most likely involve elements of computing. Furthermore, in recent years, a lot of classrooms have switched to online homework systems which allow students to download assignments as they are made available and this allows them to turn them in over the internet for an immediate score. With the readily available learning management system, i-Learn as a free digital medium for UiTM students, I-LAB is seen as a teaching tool that suits the needs of the millennial generation. Aligned to learning transformation worldwide, Faculty of Civil Engineering believes that the process of preparing laboratory reports, the submission, evaluation and storage must be in digital platforms as stipulated in Education 4.0. This programme is developed using Microsoft Excel software and is necessarily considered as the standard for spreadsheet software. It is considerably supported on variety of platforms including smartphones and tablets. Therefore, students can do their laboratory report anywhere and anytime.

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