Work in Progress – Improving Writing of Laboratory Reports

Lawrence C. Chirwa
University of Ulster, School of Electrical and Mechanical Engineering,
Newtownabbey, U.K. BT36 7QQ.
l.chirwa@ulster.ac.uk

Abstract - This paper presents methods of improving the writing of laboratory reports by means of informed assessment and formative feedback. This is achieved by informing students of among other aspects, the required structure, content, assessment criteria with corresponding weightings, common errors, software publishing aspects and other auxiliary information relevant to making a quality report such as formatting. Peer evaluation is an effective method of achieving this combined with the use handouts and online resources. The methods presented can be applied to improve other types of reports as well.

Index Terms - technical, writing skills, report, laboratory.

INTRODUCTION

The observations presented in this paper were prompted by a case study on report writing of a second year engineering class. This paper presents an overview of factors to promote good practice in writing laboratory reports.

Most engineering courses include laboratory based experimental work and as a result students are required to write laboratory reports. These reports reveal inadequacies especially apparent in first year students, but are also common for students in their later years of study.

Good report writing skills are important in engineering. An inability to write good reports may result in even brilliant ideas or results being overlooked and ignored. However, good report writing is acquired over time. It is therefore important that all engineering programs incorporate some development of technical writing skills. As most engineering disciplines are analytical in nature students lack opportunities to practice writing. In order to address the inadequacies of technical writing skills of students some institutes have introduced courses in technical communication skills. However implementing technical writing courses is costly and requires considerable time, effort and manpower. The effectiveness of these courses may be further diminished because students think writing is not a valuable component of their field of study.

METHODS

A contributing factor to poor technical writing skills of students is that they are mostly novices in their course of study. They are thus wanting in factual, semantic, schematic and strategic knowledge in these areas [1]. As a result they suffer from reasoning error or fallacy [2]. They tend to focus on less important features of problems. They ignore relational structure and apply little logic in making arguments but instead rely on superficial features, such as content and believability. Novice writers rarely plan, rather they simply begin writing, in the hope that the structure of their composition will some how be realized.

A mistake that is often made by course instructors is to presume that students have acquired good technical writing skills and are proficient in electronic publishing by the time they reach college. This may further be aggravated by assuming that they know the appropriate format of the reports required for their course.

An effective way to improve the quality of reports is by providing students with guidelines and making them aware of the assessment criteria and aspects that will be penalized [3]. This includes providing report outline structure, aspects to be evaluated as well as their weighting.

STRUCTURE AND CONTENT

To improve the report writing skills students should be informed what to include in their report. Of this information the required content and structure is an essential component. A typical laboratory report usually comprises of the following sections: Cover/title page, Table of contents, Summary, Introduction, Theory, Method, Discussion, Conclusion, References and Appendices.

The summary should be concise and include the purpose, description and findings of the experiment. The introduction is an overview of the topic being covered relevant to the experiment. Results should be presented in an appropriate form, such as tables and graphs. The discussion should comprise of analysis, interpretation and explanation of results and observations. References should ideally be readily available sources. Appendices include material that is involving, in large quantities, or may distract focus of the reader. Mathematical proofs are an example.

In addition to the report structure it is beneficial to add formatting requirements, which do not necessarily affect writing ability but improve the quality of the report, such as those pertaining to page numbering and headers and footers.

ASSESSMENT

In addition to informing students what they are expected to include in their reports, informing them of the assessment
scheme also contributes to improved reports. As a result the guidelines for reports should include the assessment criteria and respective weighting.

Usually the bulk of the marks are allocated to technical content and analysis. However allocating significant marks to auxiliary aspects that are never the less important in the making of a good report such as general presentation, organization and layout, including spelling and grammar errors, help students write better reports.

The use of constraints such as the minimum number and type of references, setting upper and lower limits to the number of words for the different sections usually circumvents writing tactics that result in poor reports, such as unstructured long rambling discussions where the information from many sources is reproduced with the aim of covering as many essential points as possible. Constraints therefore enable students to be critical, analyze information and be concise, encouraging quality over quantity.

Common bad practice such as long rambling reports; spelling and grammar mistakes; unclear meaning due to confused grammar (at times deliberate when a student does not know an answer); lack of evaluation (avoiding to discuss or conclude); distorted and fabricated information can also be effectively reduced by penalizing.

**FEEDBACK**

Formative feedback is essential in learning [4]. By reflecting on feedback students are able to take remedial action and improve their report writing skills. Commenting on strengths as well, adds value to feedback.

**COMMON ERRORS**

Common errors can make an otherwise good report appear unprofessional. These errors appear obvious to the experienced writer but are however oblivious to the novice. A common mistake made by students is to write as a student writing for a professor. Such an approach can easily result in a report lacking a professional tone. Rather considering themselves as scientists or professionals writing for an institution helps attain a professional tone [3]. Common errors include:

- Expressing personal feelings and experiences.
- Use of incorrect or lay terminology.
- Merely concluding that the experiment was a success.
- Not defining unconventional symbols or where ambiguity of what they represent may arise.
- Using multiple or qualified superlatives.
- Improper presentation of figures and tables and referencing of equations within text.
- Not proof reading the completed report!

**PUBLICATION TOOLS**

Reports now usually have to be written using electronic media. As a result a lack of adequate software publishing skills and knowledge can adversely affect the quality of a report. Information provided in this respect should also include that on specialized tools such as equation editors, image and graph plotting applications. Portability and conversion between software applications are areas that also need to be addressed.

**COMMUNICATING REQUIREMENTS**

The form in which the above aspects that make for better report writing are imparted to students has some bearing on their effectiveness. Students can be informed by several means such as handouts, online web resource, or classroom sessions. Use of a combination of these methods tends to be more effective than the use of a single method. In addition having an obligatory exercise or questionnaire may ensure that students actually use the resource material.

A commonly used approach that is particularly effective is peer evaluation [5]. This is a good method as it supports different learning types and has been shown to develop technical communication skills. Peer evaluation requires thinking at high levels [6] and therefore also helps develop critiquing abilities, better understanding and the ability to express things clearly.

**CONCLUSION**

Improved writing can be achieved through informing students on the structure, assessment, common errors, software publishing and, by use of formative feedback and peer evaluation. The means of informing students of the requirements affects the effectiveness of the methods. The use of a combination of methods is more effective than the use of a single method. Many aspects that have been presented here may also be applied to improve writing in other types of reports.

**REFERENCES**


