

James Bueno

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Scaffolding to Support Problem-Solving Performance in a Bioengineering Lab—A Case Study

There are many strategies professors or instructors use in courses to help students in the class. In this analysis, we'll be viewing a lab report on the strategy of scaffolding, designed for problem solving in bio-engineering labs. There are eight elements that will be discussed based on chapter 19 of the Technical Communications textbook (Markel & Selber, 2017, p.520). One of the authors of this lab report is Renee M. Clark, who works in the Engineering Education Research Center at the University of Pittsburgh, who has been an engineer and analyst for twenty-five years and also received a M.S. degree in mechanical engineering from Case Western. The second author is Arash Mahboobin from the Department of Bioengineering at University of Pittsburgh and does research on computational and experimental human movement biomechanics, bio-signal processing, and engineering education.

Title

The title for this lab report is clear as to what the purpose of this writing is. Having the title "Scaffolding to Support Problem-Solving Performance in a Bioengineering Lab—A Case Study" shows how one temporary structure could improve the work done in a bioengineering lab. This title brings attention to people in the field of bioengineering as it relates to lab processes and for those who struggle to solve difficult problems brought up to them. When the title says scaffolding, they don't mean the physical structure used to build buildings, but use the word to represent giving support or feedback in problem solving.

Abstract

The abstract included in the report presents all necessary aspects needed in which it includes the introduction, methods, results, discussion, and conclusion. It provides short descriptions for each of the eight elements we are discussing.. For instance, towards the end of the abstract, the report states, “Findings: A statistical comparison of project scores across semesters revealed performance improvements with scaffolding”(Clark & Mahboobin, 2018, p.109). This short part of the abstract shows how the authors of the report took a portion of the results and included it to explain how scaffoldings improve performance in these labs. This element compares to the lab report “Bile Salts Enhance Lipase Digestion of Fats” (Markel & Selber, 2017, p.529) in the way in which both give some information from each element required to give a small summary of the entire report . Each description of elements connects to the whole purpose of the lab report and its title. One way in which they both differ is because in this lab report, the abstract doesn't include any materials as that is one of the eight elements as to the sample lab report from the textbook which includes how much milk, water, bile salt, etc was used.

Introduction

In this introduction, the author starts to provide details on the main concept of the report, “scaffolding”, in several different ways. The writer gives knowledge on the topic and helps us get an understanding of the topic. For example, in their lab report, they state, “With scaffolding, the instructor assists the student with parts of the task that he/she cannot yet accomplish independently”(Clark & Mahboobin, 2018, p.110). Here the authors show how using this idea of scaffolding is used in areas like bioengineering courses by the instructor with difficult assignments. They expand on this point by showing the impact this term has had on

students. It's been shown that scaffoldings have helped increase students' higher-level thinking. This report is similar to "Bile Salts Enhance Lipase Digestion of Fats" (Markel & Selber, 2017, p.529), in which they both give the readers an understanding on the main point the lab report is trying to explain. They both start their introductions by giving a small description or definition of the topic (pancreas or open-ended problems).

Methods

This part of the lab report goes along with the guidelines of what the methods section is supposed to do. The authors first start off by including any material used in the experiment that was conducted, like including there were eighty students in the laboratory and that they were given instructions on what their task was (Clark & Mahboobin, 2018, p.111). Putting this in the beginning of the report makes it easy for other individuals to perform the experiment since they have knowledge on it. The lab report divides the methods section into four different parts, in which each explains its own part of the experiment. For instance, part 'C' says "Course Changes and Scaffolding Strategies" which states one of the methods the authors Clark & Mahboobin have behind their idea of higher-level thinking in bioengineering labs. Another thing that stands out in this section of the lab report is the use of a bar graph and tables. Using diagrams like this helps readers see important facts and details since graphs and tables are organized which can be useful for viewing results of an experiment.

Results

The results part of this lab report presents valid use of data gathered from the lab experiment with the students as the authors use a table to show the average of scores before and after scaffolding. From the table, Clark and Mahboobin were able to prove their hypothesis on

scaffoldings improving performance in these bioengineering labs. For example, on table four we saw an increase in scores from year 2014 to 2016 for projects one and two (Clark & Mahboobin, 2018, p.114). This report also provides relevant information that the instructors noticed after semesters in which they use the strategy of scaffolding, like students having less coding errors when using MATLAB or. They expand on this by giving us evidence on what type of scaffolding solutions they have used for problem-solving which shows the author presenting evidence on their hypothesis. In this report, the writers don't indicate what information used is not relevant and why they don't, which doesn't follow the components of the results element from the Technical Communication book (Markel & Selber, 2017, p.522). They organize their results section by dividing it into four different parts based on the experiment in the lab. Clark and Mahboobin do not fail to explain what is being shown from the tables they included, as they explain that each project had different challenges than the others. Between both lab reports, they use several projects/groups to show the results of the tests with different dependent variables.

Discussion and Conclusion

In the beginning of the authors discussion, they start by stating what scaffolding strategies were as they combined two elements into one section. They succeed in providing major trends or patterns to sum up the entire experiment. For instance, in the discussion part, the authors state, "The instructor postulated that these improvements were achieved because students were strongly encouraged to repeatedly practice and demonstrate the revision of their work" (Clark & Mahboobin, 2018, p.116). Both authors fail to support their findings discussed with data from the experiment about student scores from the projects, compare to "Bile Salts Enhance Lipase Digestion of Fats" (Markel & Selber, 2017, p.531), where they include which tubes they were describing and what factors played into them changing. Including,

a specific con to their discussion and conclusion helped the authors go along with the guides from the textbook, stating that there is a limit to which open-ended problems can be solved with the scaffolding strategy. One thing both reports have in common is that they show where they got their research from and how they used the research for their experiment. In the end, the authors discuss how researchers are going to expand on scaffolding with future open-ended problems.

References

The citation of the lab report was somewhat different in a way but still followed the guidelines from the Technical Communications textbook. Clark and Mahboobin cite their work in the introduction, materials and methods, and discussion sections of the report which is required to do so, but instead of using APA intext citation, they write a number at the end of their statement indicating which citation from the reference page they used.

In essence, the overall lab report was great as it followed almost all of the guidelines from each element expressed in the textbook. The author was able to support their argument by using the results and putting them into a table. One thing the report didn't follow was in the discussion, where the authors forgot to support one of their arguments with data from the results of the experiments. This report was different from the example one given to us since there was really any materials used in this experiment but the students, while in the example lab report, there were items used, like whole milk, water, bile salts, etc. An addition that could have been made was including failed experiments from the entire test to show others who want to try out this experiment what could have gone wrong.

Works Cited

Clark, R., & Mahboobin, A. (2017, October 16). *Scaffolding to Support Problem-Solving Performance in a Bioengineering Lab-A Case Study*. IEEE Transactions on Education.

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____Markel, M. & Selber, S. (2017). *Technical Communication - Twelfth Edition*. Bedford/ St. Martins