

DISCOVERING STATISTICAL MISCONCEPTIONS AS STUDENTS CREATE NOTES FOR TESTS!

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Abstract

Educators are often left guessing how, when, and where misconceptions develop in mathematics and statistics. Students will leave many blank spaces on test papers, which is little or no help to educators as to why they could not complete the question. Stress and nervousness play a part in assessments, and students will not remember why they wrote a particular solution or why they left a blank space. Educators have tried to alleviate this situation by allowing students to create their own notes to use during tests and examinations. As educators, do we ever provide specific instructions on how to create useful notes to help in assessments? This question was posed to students attending Curtin College, who responded with an overwhelming “no.” Curtin College is an alternative pathway college that provides courses for students who have not obtained enough points for university entrance or overseas qualifications that are not recognised in Australia. A new format has been adopted for the revision class in the hope that it will improve their skills in creating notes for tests. Students arrive at the classroom expecting to complete questions on the whiteboards about probability, specifically Venn and Tree Diagrams, Tables, and Symbolic Formulae. Most classes during trimester are interactive, but this week, unlike other weeks, students will drive the content seeking to generate the perfect set of notes for the assessment. Students working in small groups will write on the whiteboards information they believe will help solve the problems in the assessment. This simple practice has the ability to reveal misconceptions that are hidden from both students and educators. In the relaxed atmosphere of the classroom, students embark on a journey of “saying, listening, and writing” that hopefully will create new memories of correct concepts. Combining these three language modalities, such as saying information aloud while listening and writing it down, can further enhance memory encoding and retention. The educator is provided with the opportunity to observe, correct, and settle arguments between students, when necessary, through questioning the notes, removing the spotlight from individuals by concentrating on the written notes thus reducing academic pressure. Misconceptions are revealed by the combination of curiosity, openness to new experiences, and being in the right place at the right time. There are many benefits for both students and educators. Not only can you see how time-consuming writing notes can be for the student, but for the educator, you can see the origin of misunderstandings and failure to recognise key points. It is hoped that this simple experience may help students provide better notes in all disciplines. The qualitative paper will elaborate on this experience in the classroom setting and how it has evolved.

Keywords: *Misconceptions, notes creation, collaboration.*

1. Introduction

There is very little literature available on using notes in assessments such as tests and final examinations. According to Charles P. Corcoran, the use of notes had no significant effect on the learning outcomes in 2020, and this is the emphasis many educators will put on the preparation of the notes for an assessment. Perhaps, taking a different perspective on the development of notes rather than focusing on improving a grade, educators could redirect the aim to developing an insight to the students’ comprehension of the topic and concepts. This qualitative paper will describe the classroom experience.

2. Background

Curtin College offers students the opportunity to finish the last 2 years of secondary education or complete the necessary units to enter the second year at Curtin University. The class sizes are smaller than at university usually no more than 25 students, this means that a relaxed atmosphere is easily created between students and educators. The classes are a mixture of explicit teacher-led instruction and interactive

whiteboard student collaboration work. Some students may be reluctant at first to take part using the whiteboard instead of the usual pen and paper but after a few lessons their shyness has faded. These students have always taken mathematical and statistical assessments with notes (often referred to as cheat sheets), but many have never had any advice on what constitutes a good set of notes nor how to use the notes as a learning tool. The students described in this paper are studying Health Sciences and are required to pass a basic unit in mathematics and statistics.

3. Classroom setting

The classroom will need whiteboards, they can be walled, mobile on wheels or smaller versions used at desks. If possible, from the first lesson have a whiteboard activity as some (or all) students may need to become accustomed to collaborating in this new fashion.

This experience may be daunting to both tackle new material in a changed interactive environment and deciding on your role within the group! The roles within the group change each lesson, within a lesson and even within a topic, this accommodates all learners. One moment a student may be a creator of ideas, then change to a director then become an editor or just be an observer. It is always thrilling to witness the progress of students in each role and all the interactions and discussions that pursue. This is how you can hear misconceptions without directly approaching students, thereby avoiding any embarrassment or drop in confidence from the student.

4. The lesson

The minor twist for students in this lesson will be as an alternative to teacher-led instruction and solving examples, students will create notes for the upcoming assessment on whiteboards without the usual prompts. Students will be asked to write notes on the whiteboards that they believe will help them answer the test questions and are allowed to use lecture notes, etc. Students have been solving questions in this manner since week one but now the task is to write notes that will give them hints on how to solve any question on a particular topic.

The challenges that face the student are which facts and strategies are important and will be useful, and the description of the hints in a manner that helps solve the problem. This is the similar experience that writers have when starting a new project and researchers when writing a paper, just where and what is the starting point? The topic of probability is chosen as it has the possibility to contain diagrams rather than just written formulae which may make the task easier to begin. The students may require one or two extra words of encouragement and may take several minutes before the whiteboard starts to be used.

5. The observations of misconceptions

The educator becomes the facilitator and stops regularly to ask questions on the material students have written on the whiteboards. This activity's emphasis is solely about the notes, not the individual student, so any student can answer the question not just the author of the notes.

“An inclusive classroom promotes a positive emotional environment for students, thus enhancing students' emotional development by making them feel comfortable, happy and more confident. This, in turn, allows students to take risks and achieve their full potential” as mentioned by Leatherman and Niemeyer (Leatherman & Niemeyer, 2005).

Students working in small groups, in the relaxed atmosphere of the classroom, students embark on a journey of “saying, listening, and writing” that hopefully will create new memories of correct concepts. Combining these three language modalities, such as saying information aloud while listening and writing the information, can further enhance memory encoding, retention and ultimately understanding of the topic. The educator will use the same strategy “saying, listening, and writing” though the order may be different, the information about misconceptions is obtained unobtrusively.

“Listening”:

Conversations may be heard by the educator as students debate on the composition of the notes and here is the opportunity to hear thoughts and reason from the students' point of view. Students are usually unaware of the educator so there is no added stress on students.

“Saying”:

The educator may be stopped to clarify certain aspects of the notes on the whiteboard and ask questions such as “how will we use in a question?”, “what do you mean by these words?” and so on.

“Writing”

Students are encouraged to walk around the classroom and see the methods other students are employing. The most common mistake for students is trying to put too much information, adding words they do not fully understand and confining all in a restricted space. In a test situation, these notes become more confusing than helpful in answering the questions. Students are encouraged to be creative and think outside of the box in the writing part of the notes.

The educator will travel with students through each group’s set of notes and ask a few questions to the “why” these words and visuals are chosen. There will be a brief summary and any corrections will be explained here if they have not been dealt with previously in the class.

Once the students have completed the notes then each group is given a question to answer using the notes. This is the real “test” of the notes as to whether they are serving the purpose they are created to do.

Misunderstandings here can be three-fold either the notes were misleading (or maybe incorrect as some notes may be missed on the walk around) or students did not understand the notes, or the vital part of information is missing or finally they could not link the notes to the question.

The educator will start to solve the question and link the lines of the solution to the notes created by the different groups. Here, both educator and students can discuss the merits of the notes and edit and improve where necessary. These class discussions will bring to light any misunderstandings in the notes and between the notes and question. Many discussions will have students experiencing a “AHA!” moment as the concept or solution now appears to make sense after many days of being hidden.

6. Conclusion

In this qualitative paper, the focus has been to redirect the attention away from notes just for use in an assessment but as a learning opportunity for both educator and student. The aim is to produce critical thinking and meaningful discussions in a relaxed atmosphere, where solving a question is not directly involved but in the background. Misconceptions may be found seamlessly as opposed to direct questioning of a student about a solution.

References

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