Comparison of examination performance in mathematics, physics and electricity of first year, level 7 student cohorts in electrical engineering

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Abstract

This contribution reports on the highly statistically significant relationship established in student examination performance in the three central scientific subjects in a Level 7, Year 1 engineering programme at Dublin Institute of Technology. A range of data is taken over seven academic years (from 2005-12 inclusive).

Description

Considering the three central scientific subjects, they are each divided for learning into two thirteen-week semesters; in each semester, students attend five structured learning hours in each subject each week (three hours lectures and two hours tutorials in Mathematics; two hours lectures, two hours laboratories and one hour tutorial in the other two subjects). The subjects are assessed in the following manner:

- Module examination (12.5% of the subject mark for all subjects), held after the completion of the first semester.
- Terminal examination (75% of subject mark for Mathematics, 50% of the subject mark for the other two subjects), held after the completion of the second semester. This examination has a compulsory question and five other questions, three of which are to be attempted.
- Continuous assessment, based on laboratory and student project work, make up the remainder of the Engineering Science and Electrical Principles subject credits.

Examination performance relationships

For the three subjects, the relationships between individual student performances in the module examinations are studied for the four academic years from 2008-2012 inclusive; for the terminal examinations, relationships are studied for six academic years from 2005-2011, inclusive. A summary of this work is as follows:

- There is a highly statistically significant, positive correlation between performance in the Electrical Principles and Engineering Science subjects, in the module examination ($n=115$, $p<0.001$, $r=0.68$).
- There is a highly statistically significant, weakly positive correlation between performance in the Electrical Principles and Mathematics subjects, in the module examination ($n=115$, $p<0.001$, $r=0.40$).
- There is a highly statistically significant, positive correlation between performance in the Electrical Principles and Engineering Science subjects, in the terminal examination ($n=159$, $p<0.001$, $r=0.73$).
- There is a highly statistically significant, positive correlation between performance in the Electrical Principles and Mathematics subjects, in the terminal examination ($n=153$, $p<0.001$, $r=0.65$).

Figures 1 and 2 show the relationships between subject terminal examination performance summarised above.

Figure 1: Relationship between the terminal examination marks for Electrical Principles and Engineering Science (Physics) 2005-11

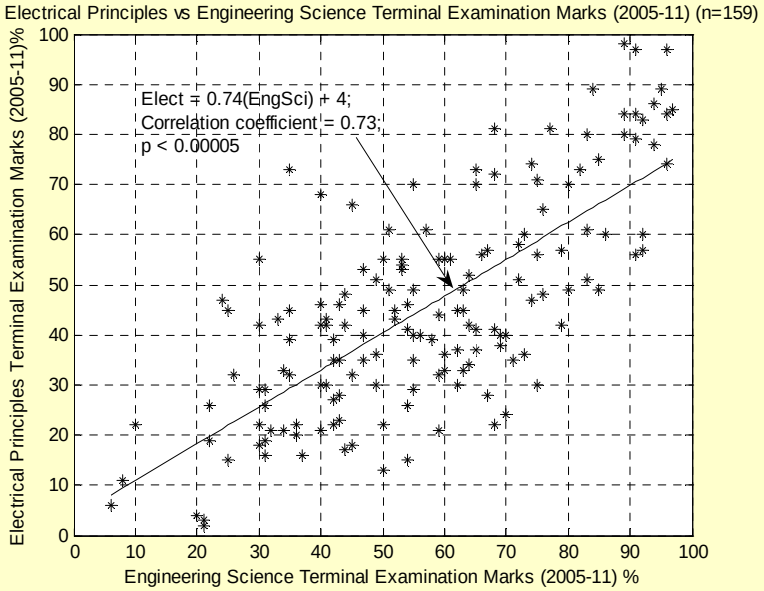
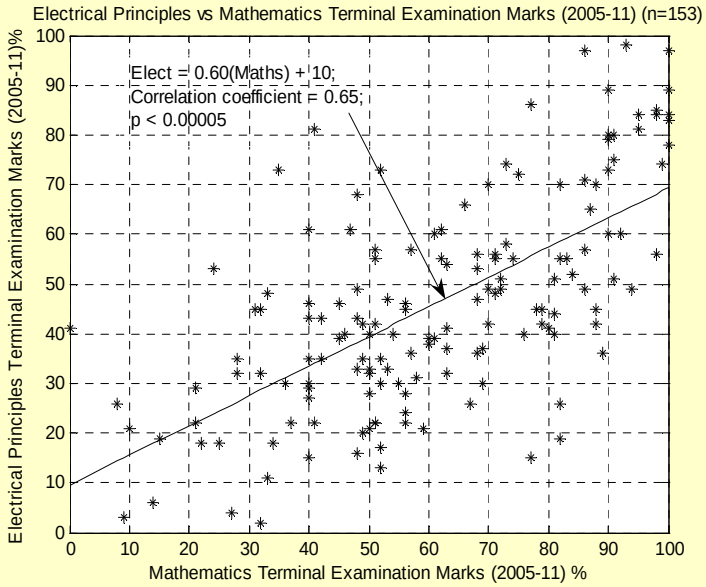


Figure 2: Relationship between the terminal examination marks for Electrical Principles and terminal examination marks for Mathematics 2005-11



Conclusions

- The author has taken an evidence-based approach.
- There are highly statistically significant relationships between student module and terminal examination performances in these core subjects.

<u>In the 2012-13 academic year</u>:

- The learning outcomes of the individual subjects will be explained in detail.
- The author will continue to communicate to students the statistically significant relationships between assessment performance and lecture attendance that has been reported elsewhere.
- Regular formative assessments, perhaps with the aid of clickers, will be encouraged;
- Further active learning techniques, including more structured mini-projects, will be proposed.