

DATA STORY FOUR

Despite their best intentions, the members of the NUT Baccalaureate Analysis and Reporting Unit (NUT-BAR) were distracted by other administrative duties after their previous meeting. While the duties were attended to, not much progress had been made on NUT Management's assigned task since NUT-BAR's linear regression analysis on the filtered dataset which revealed that:

- 1. Past academic performance is moderately associated with a student's first term GPA;**
- 2. Past academic performance is weakly associated with a student's final cumulative GPA.**

During the last session, Jennifer challenged the team to look deeper at the data by organizing the data by categories. She also suggested using "School" to segment the data and provide a more detailed analysis. The team then discussed how they could compare the data both within school and across schools. Luke proposed that they could calculate the correlation coefficients to compare the strength of the relationship for each school. He later presented a conversion table linking correlation coefficient ranges to strength labels to make the correlation between variables easier for people to understand.

With the end of the project firmly in sight, Angela reconvened the team for one last coordinated effort to put everything together.

Angela: "Good morning, everyone! Several days have passed since we received the bosses' task. I'm feeling like today is the day we complete it!"

Jennifer: "Absolutely. The only outstanding item is to condense the results into a presentable package that can stand on its own. Otherwise, it'll be confusing to explain."

Angela: "Indeed, what we need is something straightforward and explanative to the Management—but easily digestible as well. I also want to give the Management a set of recommendations based on our analysis that they can think about. Focusing on clarity and guiding them toward the next step will help us close the questions we raised."

Jennifer: "Ok, I got some ideas. I believe it's easy for us to present the regression coefficients as this shows us the increase in GPA for a unit increase in Pre-Entry Score. We can show the values using a bar chart easily. For the strength of association, I think we often see charts visualised using different colours or transparencies in reports. We can use the same approach like using different colours or transparencies on the bars to indicate different levels of strength."

Angela: "Interesting, can you elaborate more on the colour part?"

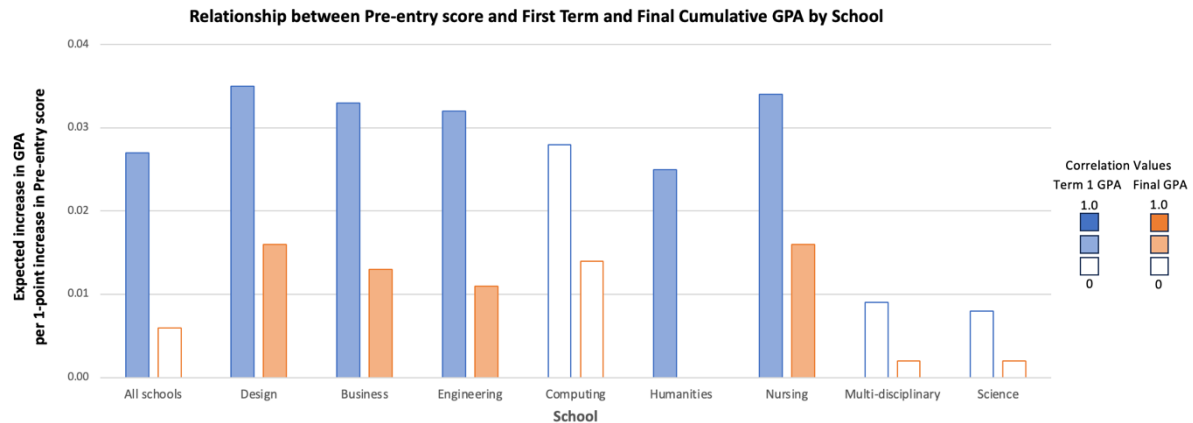
Jennifer: "Let's go back to Luke's conversion chart. I'm thinking we can match the three ranges to three shades of a colour. Each shade can be applied to a bar to indicate its strength of association. Darker shades could indicate stronger associations. Then, it would be easy for viewers to compare strengths of association!"

Jayce: "That's a terrific idea!"

Angela: “Good job, Jennifer! Can you make the visualisation to show us?”

Jennifer: “Certainly! Can you guys see the attachment I sent just now?”

Figure 1: Relationship between GPAs and Pre-Entry Score by School



The team looked at the figure (Figure 1) Jennifer sent to them. Strengths were measured using the correlation coefficients between Pre-Entry Score and the respective GPAs. The expected increase in the GPAs, given a one-point improvement in their Pre-Entry Score, was illustrated along the y-axis. The relationship was shown for each school across the x-axis. The strength of the relationship was shown by the intensity of each bar’s colour¹.

Jennifer: “A one-point improvement in Pre-Entry Score is associated with no more than a 0.04 increase in First Term GPA. For the Final Term GPA, it’s about half as large. No more than 0.02.”

Luke: “The colours of the bars show that the strength of association between Pre-Entry Score and first term GPA is weak or moderate across the eight NUT schools. Different schools have different magnitudes of associations.”

Jayce: “Correct! I also noticed that compared to the First Term GPA, the strength of the relationship between Pre-Entry Score and Final Term GPA decreased to the point that it can be concluded there is a negligible² relationship between past academic performance and final cumulative GPA for most schools.”

Jennifer: “Indeed. I thought it was interesting to see that there are differences across schools, but the underlying relationship is quite weak.”

Angela: “I think your chart makes the point. We’re getting there, team. Maybe we can provide the following summary statements:

¹ In the legend, the three colours correspond to the categories “weak (white/transparent),” “moderate (light),” and “strong (opaque).”

² In this case, “negligible” refers to a near 0 correlation value and a near 0 magnitude such that even if there was an actual correlation between values, it would not meaningfully explain differences in GPAs.

1. A one-point increase in Pre-Entry Score is associated with no more than an expected 0.04 increase in First Term GPA, and an expected 0.02 increase in Final Term GPA.
2. The strength of association between Pre-Entry Score and First Term GPA is moderate, with differences across schools. The strength of association between Pre-Entry Score and Final Term GPA ranges between weak and moderate, again with differences across schools.
3. There is a negligible³ relationship between past academic performance and final cumulative GPA for most schools.”

Jennifer: “Sounds good to me! If those are the conclusions, maybe now we can finally agree on some recommendations for the Management team. I’ll start. One thing I noticed is the lack of GPAs from other terms. We got their first term and their final GPAs and nothing in between. That’s 4 to 10 missing terms depending on the programme. **NUT Management should request an analysis of Pre-Entry Score and the GPAs from other terms to see where the moderate relationship between Pre-Entry Score and final cumulative GPA shifts to weak for each school.**”

Jayce: “Yes, totally. I think we’re helping the Management fight a myth here. I think many students believe that if they performed well in JC or polytechnic, they could easily excel at NUT. I believe this is quite a stereotype. But the analysis results show us that the relationship between past and future academic performance is not that strong. Maybe there are other influential factors we don’t even know about. In that case, I would suggest a good communication between NUT and the coming students. The university should convey the message to the students that **there may be a relationship between their JC or polytechnic performance and their current college life, but essentially, it may not mean anything as they progress towards the end of their university lives. Students cannot depend solely on their JC or polytechnic knowledge or skills when doing their studies at NUT. As the programmes deepen, many things in the programmes or courses may change, and students must modify their patterns of learning to attain higher grades.**”

Luke: “True, your point makes a lot of sense to me. However, I believe **the university or each school needs a deeper analysis of the course designs and learning activities present in the courses.** An analysis like this could reveal whether what you said is true.”

Jayce: “Yes, thanks Luke! Just to add on, the university could also let students know that **NUT can help students transition into their university life better.** We can see students who didn’t do so well during their JC or Polytechnics still can do good during their time at NUT. This could be **the university is also helping students to learn better!**”

Jennifer: “I like where you are going, Luke, but ‘better’ requires a point of comparison. I think **the university should consider sharing historical data with students.** If students can see for themselves that their academic performance in JC or polytechnic is not expected to be strongly predictive of their academic performance at NUT in the near or long-term, they may be more

³ In this case, “negligible” refers to a near 0 correlation value and a near 0 magnitude such that even if there was an actual correlation between values, it would not meaningfully explain differences in GPAs.

likely to apply more sophisticated learning strategies during their first term no matter how well they did academically before arriving at NUT.”

Jayce: “I couldn’t agree more with you two. Additionally, I have a recommendation for long-term development. **NUT Management could encourage faculties to innovate on their course designs, materials, and assessment practices to make them more authentic in terms of learning and preparation for the future.** Students should be well prepared during their undergraduate studies, and this essentially differentiates their college life from their JC or polytechnic academic experience. While students may currently believe that there is a strong relationship between their pre-entry grade and their academic performance at NUT, changes in materials and assessment practices during the first term may have an impact on this mindset.”

Angela: “Terrific! I like that your recommendations are tied to the evidence and linked to strong justifications. Let’s write this all up so your dedication and collaborative efforts make a difference. It’s 10am now. I’ll have time this afternoon to review your draft and get back with any questions. If everything works out, we’ll have a comprehensive report for the Management by the end of the day. I believe our findings will provide valuable insights for decision-making.”

Angela paused again as she thought through the next steps.

Angela: “I don’t want it to stop at a report, though. I’ll take the initiative to schedule a meeting with the bosses to present our data analysis results and recommendations. That will give them a chance to see your professionalism and enthusiasm. I’m confident that our findings will resonate positively with the Management team.”

Jennifer: “Thank you, Angela! Thanks Luke and Jayce!”

Luke: “Thanks all!”

Jayce: “Great work, everyone!”

Angela: “Let’s stay engaged and keep the lines of communication open as we finalise the report and prepare for the presentation. Your perspectives and input will be invaluable in ensuring a comprehensive and polished outcome. Once again, fantastic work, team! I look forward to reading everything in full later today and watching you shine during the presentation.”

With a shared sense of achievement, the team dispersed to tackle the remaining tasks, buoyed by Angela’s encouragement and motivated to deliver a compelling report and presentation.