

251 Implementing Baseline Mathematics Testing and In-Curriculum Peer Mentoring Scheme to Improve Attainment and Continuation of 1st Year Engineering and Computer Science Students Post COVID-19.

Gareth Woods, Pinar Ozbeser, Nicola Allett, Goudarz Poursharif, Ellen Pope

Aston University, Birmingham, United Kingdom

Research Domains

Learning, teaching and assessment (LTA)

Abstract

In 2022-23, the College of Engineering and Physical Sciences (EPS) at Aston University, implemented a college-wide Peer Assisted Learning (PAL) scheme in all first year Mathematics modules in response to attainment gaps observed between 2019-2022 in first year mathematics modules across EPS programmes. This work describes some of the reasons behind the attainment gaps observed, the approach taken, and some of the initial data collected to explore whether participation in these timetabled in-curriculum PAL Mathematics sessions for first year EPS Engineering and Computing students improves students' attainment in their respective Mathematics modules and enables them to continue to the next stage. This in turn allows us to explore whether participation in the PAL scheme improves the chances of successful transition into the first year and engagement with Learning Development Centre support. Analysis conducted on first year Mathematics modules demonstrated the significant impact of attending PAL sessions on students' academic performance.

Full paper

Motivation

Aston University has a diverse student body. In the past four years, 68.3% of our full-time UK domiciled undergraduates were from Black, Asian, and minority ethnic backgrounds. Between 2015-2018, 49.9% of our undergraduate student population were from the two most deprived Index of Multiple Deprivation (IMD) quintiles. In the College of Engineering and Physical Sciences (EPS), the proportion of students entering our Engineering and computing courses from IMD1&2, who are least likely to succeed in Higher Education (Summers et al., 2023), has increased steadily from 38.2% in 2018 to 44.8% 2022 as shown in Table 1. Coupled with the decreasing percentage of first year entries that have A/AS level entry qualifications, this has led to significant fail rate since returning to on-campus closed book exams in first year Mathematics and modules of mathematical nature.

Table 1

Academic Year	1st Year EPS Students from IMD 1&2	1st Year EPS Students A/AS Level Entry Qualification	1st Year Progression Rate at 1st Attempt for EPS Students from IMD 1&2.
2018-19	38.2%	74%	49%
2019-20	41.7%	61%	52%
2020-21	42.9%	50%	59%
2021-22	44.8%	48%	36%

Given the trends observed above and the previous success of timetabled Peer Assisted Learning (PAL) Mathematics sessions at smaller scales in EPS (Doss et al., 2020 and Knight et al., 2021), in 2022-23, EPS implemented first year PAL sessions across all Engineering and Computing Mathematics modules in partnership with Aston University Learning and Development Centre (LDC).

Peer Assisted Learning Scheme

Peer Assisted Learning (PAL) is a “socially focused” system of student support where students work together to develop their learning (Hilsdon, 2013) that encourages collaboration and knowledge exchange within a safe space (Malm et al., 2012; Malm et al., 2016). In academic year 2022-2023, a PAL scheme was implemented in the College of Engineering and Physical Sciences for all first year Engineering and Computing Mathematics modules. In the first week of term, first year students completed a diagnostic test to determine their existing maths knowledge and skills and identify areas that required improvement. On receiving results, the students were signposted to support from the LDC and PAL sessions. Each week, students were timetabled an optional, hour-long, PAL session guided by ‘PAL leaders’ who were second year and final Year undergraduate students who had been carefully recruited through an interview process. These leaders had a deep understanding of the subject materials and had completed an online training course and in person half-day training delivered by LDC to prepare them for the challenges they might encounter during the PAL sessions. They also attended regular debriefs for sharing their practices, and to provide feedback and received ongoing support to ensure the sessions were engaging, relevant and impactful. During the PAL sessions, students engaged in collaborative activities, discussion, and problem-solving exercises.

Initial Observations

Two diagnostic tests were given to the students depending on the entry requirements for their chosen programme. Based on the 2022/23 academic year, 1065 students entered EPS at Aston University, with 521 students taking the diagnostic quiz – 49% of the student cohort. Tables 2 and 3 shows that that students from certain ethnicities/socio-economic background appeared to score better than others in the diagnostic quiz.

Table 2: Summary of the 2022/23 diagnostic scores based on student's ethnicity. Value in brackets represents the sample size.

Ethnicity	Diagnostic Score for Programmes Requiring A-Level in Mathematics	Diagnostic Score for Programmes Requiring GCSE in Mathematics
Asian	56.8%(n=111)	55.5%(n=118)
Black	49.6%(n=38)	38.8%(n=46)
White	66.5%(n=49)	51.0%(n=96)
Other	54.8%(n=42)	49.8%(n=25)

Table 3: Summary of the 2022/23 diagnostic score data based on student's socioeconomic background. |

Socio Economic Grouping	Diagnostic Score
Higher socioeconomic groups, i.e. managerial and professional occupations.	55.5%
Lower socioeconomic groups, i.e. unemployed, routine or semi-routine occupations.	48.5%

Previous entry requirements have also been shown to have a significant impact on the students diagnostic score and subsequent outcomes (Knight et al., 2021). This will be investigated further as the data currently available does not allow us to make a similar investigation.

The statistical analysis conducted to date has demonstrated the significant impact of attending PAL sessions on students' academic performance. Students who participated in these sessions showed significant improvement in their learning outcomes with an average increase of 15.7 % in their grades (Table 4).

Table 4:

		Group Statistics			
	Participate in PAL sessions	N	Mean	Std. Deviation	Std. Error Mean
Academic Improvement	No	120	1.1968	26.56212	2.42478
	Yes	103	15.6538	25.58818	2.52128

Furthermore, a correlation analysis was conducted to examine the relationship between the number of PAL visits and academic improvement. The result of the correlation analysis shows a significant positive correlation (Table 5) between the two variables. This means that as the number of PAL visit increases, students are more likely to observe improvement in their grades.

Table 5:

		Correlations	
		difference	PAL no visits
Academic Improvement	Pearson Correlation	1	.269**
	Sig. (2-tailed)		<.001
	N	223	223
Number of Pal vlsit	Pearson Correlation	.269**	1
	Sig. (2-tailed)	<.001	
	N	223	223

** . Correlation is significant at the 0.01 level (2-tailed).

Remaining Work

From an initial analysis it has been shown that those students who participated in the PAL sessions had a significant improvement in their learning outcomes with an average increase of 15.7% in their grades. In the next stage of our research, we need to investigate which groups of students benefitted most from the sessions, and if engagement with the sessions changed the students’ outcomes. We also need to investigate if the differences in student outcomes are based around a student’s ethnicity, or other factors such as previous qualifications and/or socio-economic backgrounds. In addition to this, there needs to be a thorough investigation into the impact of the PAL scheme and how it has supported the different groups of students.

References

- Doss, T.P. Allett, N.F, Woods, G.J., Poursharif, G., and Knight, G. (2021) 'Effective measures of tailored learning support for Engineering Work-Based Learners in HE: A Case study'. Higher Education Pedagogies 6 (1), 66-78. doi: 10.1080/23752696.2021.1882327
- Hilsdon, J. (2013) 'Peer learning for change in higher education', Innovations in Education and Teaching International, 51(3), 244-254. doi: 10.1080/14703297.2013.796709
- Knight, G., Powell, N., and Woods, G. (2022) Combining diagnostic testing and student mentorship to increase engagement and progression of first-year computer science students European Journal of Engineering Education 47 (5), 712-724. doi: 10.1080/03043797.2022.2063109
- Malm, J., Bryngfors, L. and Mörner, L.-L. (2012) 'Supplemental instruction for improving first year results in engineering studies', Studies in Higher Education, 37(6), 655-666. doi: 10.1080/03075079.2010.535610
- Malm, J., Bryngfors, L. and Mörner, L.-L. (2016) 'The potential of supplemental instruction in engineering education: creating additional peer-guided learning opportunities in difficult compulsory courses for first-year students', European Journal of Engineering Education, 41(5), 548-561. doi: 10.1080/03043797.2015.1107872
- Summers, R., Higson, H., Moores, E. (2023) 'The impact of disadvantage on higher education engagement during different delivery modes: a pre- versus peri-pandemic comparison of learning analytics data'. Assessment and Evaluation in Higher Education, 48:1, pp. 56-66. doi: 10.1080/02602938.2021.2024793