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## Reflections on co-ordinating peer-assisted learning in a university mathematics department

### Cover Page Footnote

Acknowledgement We are grateful to Prof. Louise Walker and Dr Holly Barker (both from the University of Manchester) for their valuable advice on planning the PAL sessions. We are also grateful to the University of Liverpool for the funding provided to run the PAL sessions.

## **Reflections on co-ordinating peer-assisted learning in a university mathematics department**

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### **Abstract**

This reflective paper explores the experience of the author while co-ordinating a relaunch of Peer-Assisted Learning (PAL) within the Department of Mathematical Sciences at a UK university. PAL involves senior students supporting first-year students through regular collaborative learning sessions, fostering both academic engagement and peer mentoring. The paper discusses the practical challenges encountered during implementation, such as student participation, scheduling, and training of PAL leaders, alongside the strategies that proved effective. Drawing on these experiences, the author will suggest potential improvements to enhance the impact of PAL in future iterations. The insights shared may be of value to other academics looking to introduce or refine similar peer-support initiatives in their own departments.

**Keywords:** Collaborative, Mathematical Sciences, Peer-Assisted Learning, Peer Mentoring

## **Introduction**

An enthusiastic and robust learning community is a vital asset for any academic institution. This is more essential now after the pandemic when we are trying to rebuild our social interactions. A broad spectrum of definition of community is explained in Rovai's work (2002) which tells us that any learning community, especially the student community, fosters collaborative learning, enhances academic performance, promotes a culture of mentorship, and facilitates a shared understanding of complex concepts. The present paper aims to reflect on one of the principal strategies (within the Department of Mathematical Sciences at a UK university) that can be leveraged to foster such a community: Peer-Assisted Learning (PAL).

PAL involves students from higher years assisting first-year students in weekly sessions. This method of collaborative learning harnesses the benefits of peer teaching, where students learn from each other, thereby enhancing their understanding and application of mathematical concepts (Topping, 2005). Peer learning strategies have been found to not only improve academic performance but also foster a culture of mentorship, mutual respect, and community building among students (Boud, Cohen, & Sampson, 2001).

## **Aim of the Project**

The project aims to explore the current state of the PAL programme within the Department of Mathematical Sciences, reflecting on their successes and areas of potential improvement, with the goal of fostering a more engaging, collaborative, and effective learning community. According to Topping (2005), peer learning promotes the acquisition of knowledge and skill through active helping and supporting among status equals or matched companions. King (2002) has argued that through thoughtful and intentional organization, PAL can encourage students to engage deeply with material, fostering critical thinking skills and a comprehensive understanding of complex mathematical concepts. After the disruption caused by the COVID-19 pandemic, Peer-Assisted Learning (PAL) was reintroduced in the Department of Mathematical Sciences in the academic year 2022–23. It is worth noting that the previous occurrence of PAL took place prior to the COVID-19 pandemic (pre-2020). Only limited information about earlier iterations was available during this relaunch. Specifically, it was unclear whether the PAL sessions had previously been timetabled or how the PAL leaders had been selected. Although the department's rationale for PAL remained consistent - that it should serve as an informal, student-led support mechanism - the precise logistics of the earlier implementation were not available. As a result, the need to build the initiative from scratch

based on the department's goal was recognised. The author co-ordinated this relaunch, and in this reflective paper, I share my experiences of overseeing the programme's implementation, including the challenges faced and lessons learned. While this is a reflective paper, it is important to recognise the ways in which our approach builds upon and is aligned with existing models and institutional experiences across the UK higher education sector. For example, the University of Reading's recent evaluation of their 2023/24 PAL scheme demonstrates measurable improvements in student outcomes, particularly in relation to academic confidence and a sense of belonging. Similarly, the Peer Assisted Learning Strategies (PALS) programme evaluated by Manchester Metropolitan University illustrates how clearly structured peer support - though originally implemented in a different educational context - can yield benefits that are highly transferable to university-level learning. The University of Liverpool has long championed PAL as a student-led, community-building model. Their resources and documentation, which were consulted as part of this relaunch, emphasise the importance of fostering leadership among student mentors and enabling collaborative academic support.

### **Focus and Highlights of the PAL Sessions**

**General Overview:** The Peer Assisted Learning (PAL) sessions are conducted weekly by senior undergraduates, known as PAL leaders, from the second year and above. This structure aims to create a casual and approachable atmosphere for first-year students (about 200-250 each year) to ask questions, as noted in Sedghi & Lunt (2015). Although these sessions are timetabled, participation is voluntary and not a mandatory part of any course's teaching activities. Importantly, PAL is not intended to replace student-lecturer interactions or duplicate tutorial style teaching. Instead, these sessions offer a comfortable and relaxed space for students to discuss their queries and concerns. An added advantage is that first-year students have the opportunity to converse about non-academic topics, outside their modules with senior students who are more familiar with university life. The focus of PAL is primarily on supporting first-year students in "core" modules which are year 1 calculus and algebra.

**Scheduling PAL Sessions:** In a typical semester, each first-year student is expected to attend a maximum of two one-hour PAL sessions per week, though efforts are made to limit this to one session. The intention to limit PAL sessions to one per week stems primarily from timetabling and room constraints. It is often difficult to identify suitable time slots and/or rooms that are mutually convenient for both students and PAL leaders. It is important to note that PAL leaders are themselves students, and additional sessions could interfere with their own

academic commitments. Moreover, increasing the number of sessions may reduce the willingness of students to volunteer as PAL leaders due to the added workload. If PAL leaders were to be remunerated for their time, securing additional funding to support more sessions would present a further challenge. Scheduling these PAL sessions around or between compulsory lectures and tutorials is beneficial to facilitate attendance, though it's not always feasible. Each semester, six to ten PAL leaders are appointed based on their interest in volunteering. These leaders, who are also students in their second, third, or fourth years, are selected with careful consideration of their timetables to avoid conflicts.

***A Typical PAL Session:*** During this relaunch, PAL sessions were scheduled twice weekly, each lasting an hour. However, due to scheduling conflicts, not all sessions could be conveniently timed around other lectures or tutorials. The format of the PAL sessions was deliberately kept open and informal. Unlike typical tutorials, no problem or discussion sheets were provided, creating a more relaxed environment. Although no structured prompting was implemented during this relaunch, this has been identified as a possible area for future improvement. A brief discussion of this consideration is also included in the next section. In these PAL sessions, first-year students were encouraged to ask questions from their core modules and engage in informal discussions. In any PAL session first-year students were free to join at their convenience and may stay for as long or as little as they wish. This flexibility is crucial for promoting engagement, as highlighted by Meletiadou (2022). Multiple PAL leaders were present during each session, and students were encouraged to interact with them. Ideally, students ask questions related to the material covered in that week or the previous week. This approach offered them a chance to review challenging problems or topics with senior students. More enthusiastic students often seek help with exercises as well. An important point to note is that PAL leaders are granted access to the Virtual Learning Environment (VLE) for the core modules, where lecture notes and assessments are stored. This ensures that PAL leaders can familiarise themselves with the course materials in advance and, crucially, can refrain from engaging with any questions that relate to open continuous assessments. To add an element of interest, we introduced weekly fun puzzles. These weekly fun puzzles are generally not directly related to the students' coursework but are designed as general mathematical or logical challenges to stimulate thinking. Typically, one PAL leader introduces the puzzle during a session and guides the students through understanding and exploring the challenge without immediately revealing the solution. The aim is to encourage playful engagement and critical

thinking. In the following week, before introducing a new puzzle, the solution to the previous challenge is shared and discussed.

***Training of PAL Leaders:*** It is important to note that the success of PAL sessions largely depends on the PAL leaders themselves. Given that these sessions are primarily unsupervised by academic staff, it is essential that PAL leaders receive formal training or induction to prepare them for their role. This aligns with findings by Zhang et al. (2024), who emphasise the importance of structured training programs for peer tutors to enhance their effectiveness. In this relaunch, the University's central Education and Pedagogic Research Unit kindly provided formal induction sessions for both the PAL leaders and the academic leads involved. In addition to this, department-specific training was delivered by the academic lead (the author) to familiarise the PAL leaders with the logistical planning and practical execution of the sessions. This training was primarily based on materials obtained from the original pre-COVID launch of PAL, which were then adapted to suit the context of the current relaunch.

### **Reflection on Challenges and Possible Scope of Improvements**

After this iteration of the PAL, we sought advice from the academic leaders of a similar assisted learning scheme at a different UK university for their suggestions. Suggestions included better scheduling, the use of more flexible learning spaces rather than lecture theatres, increased commitment from PAL leaders, opportunities for interaction with PAL leaders before and after sessions, and more chances for group work. At the same time, we were also advised to retain particularly several aspects of the PAL sessions: their distinct nature compared to traditional tutorials, the chance to receive assistance from senior students rather than academics, and the relaxed atmosphere free from the constraints of problem-sheet-focused activities. Taking all this into account, this paper presents the key lessons learned from this iteration of PAL, along with a set of recommendations for future implementation. It is important to note that no formal feedback was collected from neither from the participating students nor from the PAL leaders. As a result, this paper is a reflective article only without any quantitative or qualitative data.

***Timetabling:*** One of the key challenges in re-establishing Peer-Assisted Learning (PAL) has been timetabling. Ensuring that PAL sessions are effectively integrated into students' weekly schedules is a complex administrative task. Ideally, these sessions should not be the first or last engagement of the day and should be positioned close to other academic activities to encourage

attendance. However, identifying a single time slot that suits all first-year students is not practical, given the diversity of their course pathways and timetables.

To address this, we propose dividing the first-year cohort into smaller groups - typically two or more. An exact way for how this can be implemented depends on the student strength and enrolment, but one possibility we can see is based on their programme of study (e.g. BSc Mathematics, BSc Mathematics with Physics). Irrespective of grouping strategies, the aim should be that students with similar timetables can be grouped together, making it easier to allocate suitable session times. While this approach adds complexity to the organisational process, it should offer a workable solution that increases the likelihood of regular attendance.

***Learning Space:*** Although the proposed structure of timetabling has a likelihood of success, we think securing appropriate learning spaces remains a persistent challenge. PAL sessions benefit from flexible, collaborative spaces - such as rooms with round tables - which are usually in limited supply. So improved coordination with timetabling and room booking teams, along with earlier planning, may help secure more suitable learning environments.

***Remunerating PAL Leaders:*** Another important consideration in improving the effectiveness of Peer-Assisted Learning (PAL) is enhancing the engagement and commitment of PAL leaders. Relying solely on a voluntary model can lead to inconsistencies in attendance, variable levels of preparation, and reduced accountability. To address this, we propose transitioning from a purely volunteer-based system to a compensated model, where PAL leaders are remunerated for their time and contributions.

While this requires funding from the University or other external funding bodies to support this initiative, by offering payment, we can formalise the role, reinforce expectations, and encourage greater responsibility among the PAL leaders. We believe this shift can lead to increased commitment, better preparation, and more reliable delivery of support to first-year students. It also sends a clear message that their work is valued, which may contribute to a more professional and sustainable PAL structure in the long term.

Unlike traditional tutorials, PAL sessions are designed to promote collaborative problem-solving and peer discussion rather than direct instruction. To support programme oversight and continuous improvement, PAL leaders report regularly to the academic lead, providing updates

and feedback on group progress and engagement. This reporting structure is essential to ensure the integrity and effectiveness of the programme while preserving its student-centred ethos.

***Grouping Year 1 Students:*** A central challenge in restructuring Peer-Assisted Learning has been to foster meaningful interaction among students while maintaining the informal and supportive atmosphere that underpins the programme. To address this, we propose organising first-year students into small groups of approximately 20-25 members, although this number can vary depending on students' enrolment. Each group would be assigned a dedicated PAL leader for the entire semester, providing consistency and building trust through a familiar point of contact before, during, and after sessions.

To nurture this sense of continuity, we recommend that PAL leaders maintain regular communication with their assigned students using informal platforms such as WhatsApp or Microsoft Teams. These channels allow for flexible, student-led engagement and are intentionally not monitored by academic staff, helping to create a comfortable space for open dialogue.

***Structure of Each Session:*** While the absence of any pre-set problem sets can remain as a conscious decision to distinguish PAL sessions from traditional tutorials, it is also worth noting that first-year students may benefit from a degree of framing or scaffolding. Structured discussion prompts, for example, could potentially enhance engagement, particularly in comparison to a fully informal format, which carries the risk of reduced attendance. This is supported by Røe et al. (2025) who highlight the role of structured peer interactions. As a result, we suggest each PAL group can be encouraged to collaboratively determine the focus of their weekly sessions in consultation with their PAL leader. This student-led approach empowers learners to take ownership of their development, while also ensuring that the content remains relevant and responsive to their immediate needs. However, we propose that these decisions be finalised in advance of each session, allowing PAL leaders sufficient time to prepare appropriate resources and ensure effective facilitation.

### **Concluding Remarks**

Organising and running Peer-Assisted Learning (PAL) has both the potential and the practical challenges of embedding peer support within a Mathematics Department. Key areas such as timetabling, PAL leader engagement, and group structuring require thoughtful planning and

institutional support. Our proposed strategies - including smaller, timetable-aligned student groups, remunerated PAL leaders, and a flexible, student-led session model - aim to strengthen the programme's impact while preserving its informal, supportive nature. The experience of co-ordinating PAL has offered valuable insights that may benefit others implementing similar initiatives across higher education institutions. It is also noted that although no formal feedback or quantitative or qualitative data has been collected during this relaunch, it would be beneficial to gather such data from both first-year students and PAL leaders in future iterations in order to demonstrate measurable success.

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