

**Running a summer journal club for an interdisciplinary community:
How to maintain engagement when members have disparate prior knowledge.**

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This summer, I had a unique opportunity to steer discussions within a dynamically changing group. I took on the role of a co-coordinator for a 10-week journal club called “Deep Learning in the Life Sciences” for a community of researchers. This seminar was a sequel to the previously successful course called “Machine Learning in the Life Sciences”. The main goal of the seminar was to explore the state-of-the-art concepts in deep learning and their applications. The seminar aimed to equip the members with the ability to integrate deep learning into the realm of biology and effectively communicate their understandings. The journal club was designed to be an unofficial, voluntary seminar. Because multidisciplinary student participation is standard in bioinformatics, I did not anticipate any major challenges when I undertook this co-coordinator role. Although it was the first iteration of this seminar, I merely thought it would be a good experience because the concept of a journal club itself is not new, and deep learning is a topic of strong interest to many. However, the uniqueness of this initiative soon became evident as the summer progressed. What set this journal club apart?

1. The members were from several different departments.
2. We encompassed a vast demographic, from undergraduates to professors, alumni, and even visitors.
3. The journal club sessions were held both in-person and online synchronously.

My experience during this summer has honed my skills in interdisciplinary teaching.

The journal club gathered researchers from multiple disciplines to discuss cutting-edge deep learning methods in recent papers. Deep learning refers to a group of methods in computer science that uses layers of networks resembling biological neural signaling (LeCun et al, 2015).

These methods have been proven highly effective in extracting information from high-dimensional data (LeCun et al, 2015). We found that the way in which they were used varied significantly across disciplines:

- In structural biology, large language models have opened a new performance frontier for protein structure prediction problems (Jumper et al., 2021; Lin et al., 2023; Senior et al., 2020).
- In computer vision, smaller image datasets could achieve good classification performance by using transformer models (Hassani et al., 2021).
- In quantum chemistry, molecular configuration predictions were most accurate using neural networks of 1 or 2 layers because the molecule in question was comparatively smaller (Gao & Remsing, 2022).

The seminar was inherently designed for researchers working on interdisciplinary projects. In our setup, everybody inevitably had limited prior knowledge. Indeed, insufficient prior knowledge was an obstacle to understanding the exact paper content (Ambrose et al., 2010, Chapter 1; Simonsmeier et al., 2022). Nevertheless, the members were able to gain practical knowledge in deep learning by thinking about problems in unfamiliar domains. Collectively, we understood the importance of creativity with the resource and scientific context at hand.

To facilitate discussion in this multidiscipline environment, I implemented several pedagogical approaches. Whenever a new member joined, the group did a round of introductions, so that everyone knew each other (Baum & McPherson, 2019; Brookfield & Preskill, 2005). Also, I prepared questions on standby to steer the discussion whenever needed (Brookfield & Preskill, 2005). Lastly, I have emphasized the importance of including background slides in the presentation to compensate for the limited prior knowledge. Because some of these strategies were effective, our journal club flourished into a cohesive inter-departmental community.

Our journal club had diverse members when it comes to expertise levels. Initially targeting participants from the previous course, I anticipated a baseline of understanding concerning what

deep learning was. However, as the roster doubled by the summer's end, this expectation became invalid. The seminar ended up exposing deep learning concepts to the novice members, but this was a divergence from the original goals. Also, given that it was a voluntary summer journal club, the attendance differed from week to week. On certain days, the majority comprised graduate students; on others, professors took the lead, and sometimes undergraduates and visitors dominated the scene. I often noticed contributions predominantly from particular subgroups, which raised concerns about inclusivity. My teaching mentor explained that participation and engagement could look different, noting that engagement can be shown both verbally and non-verbally (O'Conner et al., 2017). My mentor said there can be many reasons for member silence as per Brookfield and Preskill (2005), with power dynamics being one in this case. He proposed that I provide as many alternative means of engagement as possible.

I tackled this issue by making a virtual space for asynchronous participation and providing more accessible prompts. I generated a Google Doc weekly so that questions could be submitted anonymously. However, because it was voluntary, nobody used it. Additionally, I asked members about their thoughts and impressions, specifically making an effort to engage quieter subgroups. When responses were scant, I shared my own impression to initiate discussion (Brookfield & Preskill, 2005). Regular rounds of introductions further created an atmosphere conducive to participation. As the seminar progressed, I could witness other subgroup members feeling more comfortable speaking in the journal club.

Having both in-person and online options is atypical of a journal club. Originally, the journal club was only intended as an in-person meeting. However, many people wanted the option to participate synchronously online, so it became hyflex per request. The reasons varied: one subgroup had already graduated and relocated; another subgroup was away doing internships; and the other subgroup simply wanted flexibility. With the exception of the last group, most people who showed interest in online options waned after a session or two. A journal club is discussion-based in nature, so it is possible that the members online felt isolated. While those

who attended the seminar in person could interact with one another in a more traditional sense, the online group faced a different dynamic. To the in-person group, the online group remained largely invisible unless the latter chose to speak. It was much easier for the in-person group to establish personal connections, know each other by name, or become familiar with each other's research areas. Despite the inevitable complications of the summer such as vacations and conferences, the seminar retained a sizable group thanks to the in-person members who kept coming back. The in-person group was more committed, and a strong feeling of community was there. Indeed, being deprived of a supportive community would negatively influence a member's motivation to learn (Ambrose et al, 2010, Chapter 3; Baum & McPherson, 2019). Providing a virtual space is generally considered a good design that provides alternative opportunities for learners (Baum and McPherson, 2019; Burgstahler, 2008). Nevertheless, I learned that the effect is highly context-dependent.

Maintaining engagement online was challenging. I streamlined access with a consistent Zoom ID for all sessions, eliminating the need to hunt for links. The online members were also actively included in introduction rounds and discussions. However, as the weeks went by, the online members showed lower engagement while the in-person members were building camaraderie. Baum and McPherson (2019) have recognized one of the limitations of online education as the underestimation of interactions between students and teachers, as well as among students. While this hyflex seminar allowed a certain degree of interaction, there were clear limitations in the degree to which I could engage the online group in the discussion. The dichotomy in learning experiences between the two formats was evident.

Despite its non-committal nature, the journal club boasted a robust weekly attendance, ranging from 9 to 20 participants. Based on the post-seminar survey, members found the journal club enjoyable and rated the seminar 4.78 out of 5. Our summer sessions offered valuable opportunities for members to delve into and experiment with deep learning concepts. Should I

have the chance to guide another iteration of the journal club, I aim to set clearer guidelines for those new to deep learning, ensuring an even more inclusive and beneficial experience for all.

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