



## **A peer community approach to research education: A case study of a student-initiated online community**

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This paper reports the trends and challenges of research education in Australia, and presents a case study of a student-initiated community for Higher Degree Research (HDR) students at a public university. The study aims to determine whether an online Community of Practice (CoP) has developed among HDR students without any design effort from the university, and whether the community helped HDR students achieve connectedness without face-to-face interactions. The results indicate that the community is a spontaneous, distributed, small but diverse HDR CoP within a faculty. Feedback from the members show that the technology employed in the community is appropriate for peer communication, knowledge sharing and collaboration in the CoP, but technical problems on the communication technology could discourage members' engagement and participation. The findings also reveal that length of the membership has a statistically significant impact on HDR student connectedness, but technology satisfaction and virtual mode do not.

Keywords: Communities of Practice, online communities, peer support, research education

### **The trend of pursuing postgraduate research study in Australia**

The Australian Government Department of Education defines a 'Higher Degree Research' or 'Higher Degree by Research' (HDR) as "a Doctorate by Research or Masters by Research" (2020, p. 6). According to the Higher Education student data released by the Australian Government Department of Education (2014), Australia had a total of 45,659 HDR students in 2003 and the number grew by 36.8% to 62,471 in 2013. While the number of Masters by Research (MPhil) students between 2003 and 2013 decreased by 16.3% (from 9,784 to 8,190), the number of Doctorate by Research (PhD) students increased by 51.3% (from 35,875 to 54,281). In early 2022, the Australian Government Department of Education, Skills and Employment released the 2020 student data (2022) which shows a similar trend despite the negative impact of the COVID-19 pandemic: the number of Australian HDR students between 2010 and 2020 grew by 19% (from 55,740 to 66,337); the number of MPhil students decreased by 5.2% (from 8,674 to 8,227); and the number of PhD students increased by 23.5% (from 47,066 to 58,110).

Since Australia is a popular study abroad destination with a large number of international students (Hasnain & Hajek, 2022), statistics related to overseas students are extracted from the available Higher Education student data (2022) to understand the composition of the HDR students in Australia. Although there was a growing number of overseas HDR students and overseas commencing HDR students before 2019, the majority of HDR students and commencing HDR students in Australia from the years 2003 to 2020 have been domestic students. Domestic students, as defined by the Australian Government Department of Education, Skills and Employment (2021), mainly include Australian citizens, New Zealand citizens, and Australian permanent residents.

In sum, the student data provided by the Australian Education Department shows a trend of pursuing a HDR, particularly PhD, in Australia for both domestic and overseas students. The majority of HDR students and commencing HDR students in Australia are domestic students, despite the high number of international students. On average, the number of domestic HDR students is more than twice the number of overseas HDR students.

### **The disengagement and long completion time issues**

However, the most recent HDR completions report published by the Australian Government Department of Education (2020) shows that domestic HDR students have a consistently higher drop-out rate than overseas

HDR students. Based on the data over the period 2007 to 2017, the average drop-out rate of domestic HDR students is 20.8%, which is significantly higher than the average drop-out rate of overseas HDR students (11.5%). In addition, part-time HDR students are significantly more likely to drop out than full-time HDR students. On average, 28.3% of part-time HDR students dropped out compared with 16.8% of full-time HDR students. While the HDR completion rate has been a concern as there is no consistent improvement (except the drop-out rates for overseas students have been decreasing steadily) over the period 2007 to 2017, another issue is completion timeframe. According to the same report, on average 67.4% of PhD students were still enrolled at the end of their 4-year cohort period. Although the doctoral education policies and funding schemes in Australia expect students to complete their doctoral studies within 3 to 4 years, Torca (2020) found that most PhD students complete their studies in the fifth year.

## A peer community approach for supporting research students

To improve HDR completion rates and reduce completion time, institutional support is necessary but not sufficient. Back in 2005, Boud and Lee had discussed the performance problem in research education, and they criticised the over-emphasis on supervision and provision of ‘hard’ resources such as equipment and physical space. They pointed out that the academic research community is a peer community, and thus they proposed “learning with and from peers and learning to become a peer in a community of research practice” (2005, p. 515) as a pedagogical approach for research education. Their peer community approach frames research learning as a social practice and interaction, and this social perspective on learning has its theoretical basis. The concept of Community of Practice (CoP) was proposed by Wenger and colleagues (Lave & Wenger, 1991; Wenger, 1998; Wenger et al., 2002), and Wenger et al. (2002) advocate that “the community element is critical to an effective knowledge structure. A community of practice... is a group of people who interact, learn together, build relationships, and in the process develop a sense of belonging and mutual commitment” (p. 34). Since the sense of belonging is recognised as a critical factor for student retention in higher education (O’Keeffe, 2013), HDR CoPs could help to address the disengagement issue.

Although Wenger et al. (2002) mention that CoPs do not have to be purely spontaneous, they emphasise that “the success of the community will depend on the energy that the community itself generates, not on an external mandate” (p. 36). Many CoPs are designed by the institutions for students (e.g., the doctoral CoP reported in Brooks & Fyffe, 2004), but may not be appealing to students (e.g., see students’ comments from Martin & Woods, 2008, p. 143 evaluating the institution-initiated doctoral CoP). By contrast, communities that emerged on the Internet (e.g., online discussion groups and gaming groups initiated by online users and players) do not have a centralised authority to lead their development but seem to be more sustainable and accommodating. It seems that a thriving CoP is more likely to be grown organically rather than made artificially. In addition, spontaneous CoPs have been shown to help keep postgraduate research students on track and maintain progress (deChambeau, 2017). Therefore, spontaneous HDR CoPs not only would improve HDR completion rates but also could help to address the long completion time issue.

## Research questions and methods

The key questions are whether (and how) spontaneous CoPs can be grown in the Australian HDR context; and what (and how) technology can help HDR students communicate and connect with each other. Answering these questions is especially important and valuable, due to the impact of COVID-19 on HDR students in Australia and around the world. Therefore, a case study is conducted to examine a student-initiated HDR peer community formed online through communication technology available to students at a public university in Australia. The community was initiated by the author in early 2022 as a peer support group, not as a research study. The idea of conducting the present study came in a casual discussion with a peer in late June of the same year, then the idea was mentioned to and supported by other peers during a subsequent regular meeting of the members in July. Since the author is a complete member of the community under study, the case study is an autoethnographic ‘insider research’ (Greene, 2014).

The advantages of insider research include a better understanding of the community under study, having convenient access to participants and data, and a deeper level of interpretation; while the challenges include ethical issues, trustworthiness, and being subjective and biased (Fleming, 2018). To ensure that the present study is an ethical, reliable and impartial research, following is a guideline derived from the literature (e.g., Fleming, 2018; Greene, 2014; Mercer, 2007; Unluer, 2012) for conducting the study.

## Conducting the autoethnographic insider research

### *1. No specific individual can be identified in the case study*

The author, as the initiator and member of the community, has a deep understanding of how the community was developed and functioned. It is evident that the author's personal narratives could provide a rich source of data about the community, but it is important to respect and protect the members' privacy. Therefore, the author will not mention personal details of any other individual when describing any thought about the community.

### *2. Only non-identifiable data which was never collected with identifiers are used*

The author has access to different kinds of information related to the community and its members, which include personal messages and emails from other members and community messages posted by other members. Although this kind of information could enrich the source of data and the author could seek informed consent from the members, the potential for implicit or perceived coercion is considered to be high because the author is in a role of informal power (the person who initiated and organised the community). Therefore, the author will not use any identifiable data even though consent can be obtained, but non-identifiable data which was never collected with identifiers will be utilised. In addition, ethics review exemption for using anonymous survey data has been obtained from the Human Ethics Office at the author's institution.

### *3. Only use data that existed before the start of the case study*

Analysing the community may unconsciously affect the author's actions in the community, which could influence the quality and trustworthiness of the data. In addition, members' behaviours may also be influenced after they knew about the author's idea of the present study. Therefore, the author will not use any data generated from July 2022 onwards given that the study was started in July 2022.

### *4. Balance between personal experience and research analysis*

Being an 'insider' would allow the author to analyse the data from a unique perspective, but since the focus is the community being studied rather than the author, it would be more appropriate to present the case as a 'realist tale', which is an ethnographic representational form that uses "third-person narration, and document field-work experiences from an omniscient, objective, and authoritative perspective" (Adams et al., 2015, p. 84). Therefore, third-person voice and point of view will be used to reflect the analytic process of the author and to analytically study the development of the community.

## Collecting case study evidence

The empirical study aims to determine whether (and how) a CoP has developed among HDR students without any design effort from the university; and what (and how) technology employed in the community helped HDR students achieve connectedness without face-to-face interactions. As a good case study uses multiple sources of evidence to investigate the phenomenon within its real-world context (Yin, 2018), the data collected and used for this case study include:

- Narratives and reflective notes from the community initiator (description of the community and thoughts about running the community)
- Documents about the community (descriptive information about the community and its online hub written by the community initiator)
- Notes taken by the community initiator for the purpose of running the community (date/time of the meetings, the number of attendees, and topics discussed in the meetings)
- Analytics data about the online community hub (the number of users, the number of messages, and the number of files shared recorded by the system)
- Data from an anonymous survey conducted by the community initiator in mid-June 2022 with the aim of improving the community (members' feedback on the community arrangement, communication technology, and peer connectedness in the community)

The collected data are records between February 2022 and June 2022, which constitutes a data set of 4 months' qualitative and quantitative data of the community.

## Case study: A Peer-to-Peer community run by HDR students for HDR students

Firstly, the background of the student-initiated community is described. Secondly, how the community was developed and its characteristics are analysed to determine if the community is a CoP or other structures (such as an informal network). The three key elements of CoP (Domain, Community, Practice) and CoP

characteristics based on the structural model and concepts from Wenger et al. (2002) are used as the framework. Thirdly, activities and communication technology used in the community are analysed to understand how the community functioned. Finally, survey responses are analysed to understand community members' needs, perceptions of the technology employed and the connectedness in the community. In the survey, peer connectedness was measured based on evaluation questions adapting the student-to-student connectedness items from the Doctoral Student Connectedness Scale by Terrell et al. (2009), which will be examined in the final section of the case study.

## Community background

The HDR Peer Community is a peer support community for postgraduate research students at a public university in Australia. Similar to most spontaneous communities, the HDR Peer Community did not intentionally start as a CoP and members were not explicitly aware of the CoP concept. This peer community was initiated by a final year HDR student (the community initiator) who felt that many research activities were suspended and HDR students were disconnected with each other due to COVID-19. The community was started in mid-February 2022 to connect and reconnect HDR students, as most states in Australia had passed the peak of COVID-19 Omicron variant in late-January 2022. After two years of COVID-19, international students are allowed to enter Australia again, schools are open and research can be resumed. It was a turning point for both domestic and overseas students. In the next section, how the community was developed is described and the community characteristics are analysed.

## Community characteristics

### *1. Domain element*

Before the HDR Peer Community was set up, the community initiator shared the idea of creating a peer support community specifically for research students with 10 other HDR students from the same academic school (which has approximately 160 HDR students). The students agreed that peers would be more responsive than university's units (such as the Student Centre) and there is a need for a collaborative space that enables them to remain in contact with their peers outside shared courses or seminars, share knowledge about doing research and support each other (even before the disruption caused by COVID-19). The students have a shared domain, as all of them are learning to do research, which "creates common ground and a sense of common identity" (Wenger et al., 2002, p. 27). In addition, this initial peer discussion shows that the community initiator took the role of 'coordinator' as described by Wenger et al. (2002) that "a community coordinator does not 'lead' the community in the traditional sense, but brings people together and enables the community to find its direction" (p. 43). Therefore, the Domain element is present, and the group structure is unlike non-CoP structures such as Project or Operational Teams in which the team leaders give directions rather than link people.

### *2. Practice element*

After the initial peer discussion, the community initiator created the community hub on the university's enterprise edition of Microsoft Teams, which is an online workspace that provides 'channels' (for threaded conversations), file sharing and online meetings features. After creating a private team named 'HDR Peer Community' on Microsoft Teams, the community initiator added 11 channels based on the needs learned from the initial peer discussion and the initiator's own experience as a final year HDR student. Table 1 shows the description of the online community hub and its channels on Microsoft Teams. 'General' is the default channel in any team on Microsoft Teams, and its description is the description of the team. The channels show that the HDR Peer Community focuses on building a shared practice, as ideas, tools, information, etc. can be shared among members enabling them to be effective in their domain (Wenger et al., 2002, p. 29). Therefore, another key element of CoP: Practice is present. In addition, the channels show that the HDR Peer Community would go beyond a Community of Interest which simply puts people with similar interests in a group configuration and a Professional Association which do not "create practice-development relationships among members" (Wenger et al., 2002, p. 44). It is because the community aims to develop "a shared practice, which directly affects the behaviours and abilities of members" (Wenger et al., 2002, p. 44).

**Table 1: ‘HDR Peer Community’ team channels and their description**

<b>Name</b>	<b>Description</b>
General	For HDR students to share knowledge and resources, offer tips and advice, and stay connected.
Ethics Application	Seek advice from your peers and share tips about getting ethics approval.
Find and Be Participants	Advertise your research study, recruit participants, and participate in your peers’ study.
Find and Be Research Buddies	Be each other’s data coders, systematic reviewers, experiment confederates, etc. and learn research skills by doing.
Get Your Thesis Done	Ask questions and share thesis writing tips, writing review, thesis editing and submission.
Meetings and Events	A channel for online catch-up and scheduling face-to-face peer meetings.
Methodology and Methods	Research approach, methodology, methods, tools, techniques, etc. - Ask questions, share, and learn from each other.
Other Topics	Discuss anything not covered in other channels or suggest new channels.
Procedures and Requirements	Questions and answers about HDR policies, procedures and processes, administrative or anything in the RECS, etc.
Proposal Writing	Anything about the thesis proposal - share your experience and advice with your peers.
Self-Introduction	Introduce yourself and get to know your peers. Edit your self-intro post anytime to share your progress.
Writing and Publishing	Questions and tips about writing papers and submitting to (and presenting in) conferences and journals.

### 3. Community element and spontaneous

The community initiator introduced this new peer community on 10 February 2022 (the initial peer discussion mentioned above), 22 February 2022 and 20 April 2022 via student zoom sessions within the school, and information (see Figure 1 below) and instructions for joining and accessing the community hub are shared via online documents that can be circulated to interested students. Current members can share these online documents with fellow students or request to add new members to the community via Microsoft Teams. In addition, a HDR support staff member from the faculty was informed about the HDR Peer Community and had directed interested students to contact the community initiator. In sum, students either learned about the HDR Peer Community directly from the community initiator or the online documents or were referred by a current member. Superficially, it seems that the community was grown from a network of professional friends and tends to organise along friendship lines. But as shown in the community information in Figure 1, the community would be more than an Informal Network for friends because it invites any HDR student to “deepen their knowledge and expertise... by interacting on an ongoing basis” (Wenger et al., 2002, p. 4) and has “a cohesiveness and intentionality that goes beyond the interpersonal nature of informal networks” (Wenger et al., 2002, p. 43). Besides, only 5 members are acquainted with the community initiator before they joined the community, all the other members did not know the community initiator before joining the community, and any HDR student at the university can follow the instructions in the online documents to join the ‘HDR Peer Community’ team after logging into their university account. Since this community is self-organised and voluntarily participated in by HDR students rather than intentionally developed by the institution, it is a community where “members spontaneously come together because they need each other as peers and learning partners” (Wenger et al., 2002, p. 26). Members are self-selected, and given that it is a community of people who care about the domain, the Community element is present and it is a spontaneous community.

As the community combines all three key elements of CoP (Domain, Community, Practice), it is a young CoP even though it did not intentionally start as a CoP. Also, it is a spontaneous CoP. To further understand how it developed and functioned, more of its characteristics are analysed.

### HDR Peer Community: A Peer-to-Peer community run by HDR students for HDR students

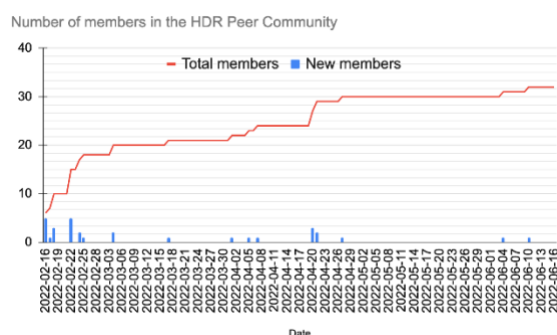
The HDR Peer Community is a new peer support community for HDR students to share knowledge and resources, offer tips and advice, and stay connected. This peer community would also offer HDR students a space to (i) advertise their research study, recruit participants, and participate in their peers' study; and (ii) be each other's data coders, systematic reviewers, experiment confederates, etc., have research collaboration, and learn research skills and knowledge (research methods, procedures, etc.) by doing.

The peer community would have both online and on-campus activities, depending on the members' schedule and needs. All HDR students are welcome no matter whether you are a full-time, part-time, or remote student, as everyone could be connected through asynchronous online interactions in the community's online space. Doing research is a challenging process and nobody knows everything, but we can share what we know to help everyone know more and get the most out of our research journey.

**Figure 1: The HDR Peer Community information written by the community initiator**

#### 4. Small, diverse and within faculty

The peer community had 20 members by the end of its first month, and the number of members slowly grew to 32 at 4 months as shown in Figure 2. It shows that the community is a small and slowly growing CoP. Over 90% of members are from the same school as the community initiator, and the rest are from the faculty which the school belongs to. The majority of the members are Education HDR students, and almost all members are PhD students. Nevertheless, the community has a mix of full-time and part-time students, a mix of domestic and international students, and HDR students from all years of study with different research approaches. Besides, the community not only has campus-based students but also students studying remotely in Australia and overseas. It shows that the community is homogeneous in terms of faculty/school but heterogeneous in terms of study mode, geographic location, cultural background, research stage and methodology. Therefore, it is a small but diverse HDR CoP within a faculty/school. After understanding the size and make-up of the community, how the community functioned to accommodate its members is examined next.



**Figure 2: Number of members during the first four months of the HDR Peer Community**

#### 5. Distributed

Although not intended when the community started, the HDR Peer Community thus far is an online community which connects its members without face-to-face interactions. As mentioned above, some members are part-time students or remote students (including those living in other cities or states and outside Australia due to COVID-19 related reasons or non-COVID-19 related reasons), and therefore they could not meet in person. The members communicate through technology and all meetings in the community have been conducted virtually. It shows that the community is a distributed CoP that “cannot rely on face-to-face meetings and interactions as its primary vehicle for connecting members” (Wenger et al., 2002, p. 115). As a distributed CoP, the community requires additional community-development effort and employment of communication technology. In the next section, the community activities and how the members communicate through technology are described and analysed.

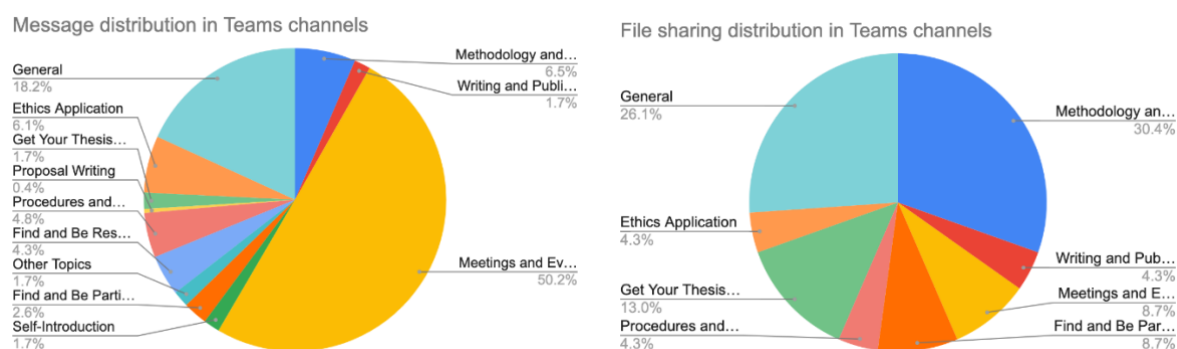
### Activities and technology used in the community

#### 1. Communication via threaded conversations and file sharing

Referring back to the online workspace created as the community hub, it is understood that the main communication technology employed in the community is Microsoft Teams. On average, the online community hub only had 5 to 6 daily active users which shows that most members did not use the online community on a daily basis. The most recent day that has the highest number of active users was 22 April 2022, and there were 15 members (out of 29) using the online community hub on that day. As shown in Table 1 above, the ‘HDR Peer Community’ team has different channels for members to discuss different topics, and these channels

constitute “a public space of the community” (Wenger et al., 2002, p. 85) for members to communicate with each other. During the first 4 months of the community, there were 231 messages and 23 files posted on the ‘HDR Peer Community’ team. As shown in the left panel of Figure 3, over 80% of messages were posted in the ‘Meetings and Events’ channel (50.2%), the ‘General’ channel (18.2%), the ‘Methodology and Methods’ channel (6.5%), and the ‘Ethics Application’ channel (6.1%). This indicates that there were more conversations regarding these topics, and reflects that active members in the online community participated more in meeting activities, general discussions, research methodology learning, and ethics application enquiries during the first 4 months of the community. Although there are first year HDR students in the community, the message distribution shows that these members did not express a need for thesis proposal support on the online community hub because ‘Proposal Writing’ was an inactive channel (0.4%).

In addition to text messages, community members can share files with their peers, but only 8 channels (out of 12) had file sharing activities as no file was shared in ‘Proposal Writing’, ‘Find and Be Research Buddies’, ‘Self-Introduction’, and ‘Other Topics’ during the first 4 months of the community. Among the 8 channels with file sharing activities, ‘General’ was again a popular channel (26.1%) but the ‘Methodology and Methods’ channel had the highest number of files shared (30.4%) as shown in the right panel of Figure 3 below. The distribution data show that the online community hub was mainly used for sharing general information and research methodology resources. Besides, 13% of files were shared in the ‘Get Your Thesis Done’ channel compared with none in the ‘Proposal Writing’ channel, which reflects that the materials available on the online community hub appeared to be more useful to members who are at the later stage of their HDR.



**Figure 3: Distributions of messages posted and files shared between 2022-02-16 and 2022-06-16**

## 2. Communication via online meetings

The members not only had asynchronous discussions via threaded conversations and file sharing, but also had synchronous discussions via online meetings which constitute another public space of the community. The community has regular meetings (1 hour each) in which members meet virtually, share progress and seek advice from other peers. During the first 4 months of the community, there were 8 meetings and the average number of attendees was 7. In these meetings, a wide range of research-related topics were discussed, which include literature review and management, writing and publication, research methodologies and methods, research collaboration and peer support, research events and opportunities, thesis proposal and ethics application, funding and resources, workshops and tools, research challenges and supervision issues, and proposal meeting and annual progress review. One of the meetings involved a peer presentation which was a thesis proposal meeting rehearsal by a member, as members were informed that they can share their research work to get feedback from other members and practice presentations in meetings. Furthermore, one of the meetings was a seminar on systematic literature review, which was presented by a member who has practical experience in conducting and publishing systematic literature review. It is because any member can volunteer to share their research methods and experiences by offering seminars and workshops to their peers. These reflect that the public space constituted by online meetings was a more thriving space than the asynchronous discussion space on the online community hub, not to mention that over half of the threaded messages were posted in the ‘Meetings and Events’ channel as shown in the left panel of Figure 3.

Communications described and analysed above are activities that occurred in the public spaces of the community, but certainly the members could send private messages to others using the Teams Chat function or communicate one-on-one using more conventional ways such as email. The community initiator had private conversations with most of the members, linked them with resources that might be helpful to them, and connected them with others who might share the same problem or might be able to solve the problem. The one-

on-one networking of members constituted the private space of the community, which is very important as the community's aliveness is created through "a mix of public and private spaces that encourage diverse forms of participation" (Wenger et al., 2002, p. 193).

Previous sections of the case study described and analysed the community based on data directly derived from the community initiator and Teams statistics (analytics data about the online community hub). The next section looks at the community from another angle by presenting what the members thought about the community.

## Member feedback

The final section of the case study analyses responses from an anonymous survey conducted in mid-June 2022 for improving the community. The survey asked for members' feedback on the community arrangement, communication technology, and peer connectedness in the community. The community was 4 months old when the survey was conducted, 22 survey responses were received from 32 members giving a response rate of 68.75%, and the majority of respondents had joined the community for more than 3 months (59.1%).

### 1. Community arrangement

The members had community meetings every 2 weeks, and 61.9% of the respondents are satisfied with such arrangement. The rest either expressed they want more meetings (23.8%) or prefer a less frequent meeting arrangement (14.3%). Regarding how long the meetings should last, over 90% of the respondents are satisfied with the 1-hour duration and the rest think that 1 hour is too long (9.5%). The feedback also shows that most respondents are satisfied with meeting others virtually (81.8%), with half of them prefer meeting online only while the other half want a mix of online meetings and on-campus face-to-face meetings. The rest either prefer on-campus face-to-face meetings only (9.1%) or want other types of physical meeting (9.1%). And unsurprisingly, respondents have different schedules and thus no single meeting day/time option could fit everyone's preference, which reflects the difficulty of arranging meetings for all members and the online meeting arrangement was appropriate in a HDR CoP.

### 2. Technology

Although the majority of the respondents (54.5%) are satisfied with Teams as the online meeting place, more than one third of the respondents (36.4%) want to move the meetings to Zoom and the rest (9.1%) are unsatisfied with both and prefer to meet in a more natural and interactive environment offered by another platform called Gather Town. Besides, some respondents expressed that sometimes they choose to be less active on the online community hub because Teams is not user-friendly (18.2%), they encounter access or technical issues on Teams (18.2%), or Teams does not support anonymous discussions (13.6%). However, most of the respondents (76.2%) are still satisfied with using Teams for peer communication and prefer Teams over other communication methods such as emails. Moreover, 81.8% of the respondents think that the 12 channels on Teams (see Table 1) are working well for their knowledge sharing and collaboration in the community. The results show that Teams is a proper technology for peer communication, knowledge sharing and collaboration in a HDR CoP, but technical issues encountered by the members or lack of some desirable features on the communication technology could discourage members' engagement and participation.

### 3. Student connectedness

Since the survey contained 9 questions adapted from the Doctoral Student Connectedness Scale created and validated by Terrell et al. (2009), the responses could be used to explore the student connectedness in the community. The original scale by Terrell et al. (2009) is a 5-Point Likert Scale (1-strongly disagree to 5-strongly agree) with 9 items measuring student-to-student connectedness and another 9 items measuring faculty-to-student connectedness. Their 9 student-to-student connectedness items were adapted to fit the context of the HDR peer community, and the adapted questions used in the survey and the results of each question are shown in Table 2. Cronbach's alpha for the adapted scale is 0.91 which indicates that the adapted scale is reliable.

The overall mean score is 4.05 which shows the student connectedness in the community is strong, although the community was only 4 months old when the survey was conducted. It is interesting that members reported that they feel a strong peer connection in the community (see Q1, Q2 and Q9 results in Table 2), but they gave a more neutral response on whether they communicate with their peers regularly (as reported by Q5 in Table 2). To understand the factors that may influence student connectedness in a HDR CoP, statistical tests are performed to investigate whether there is any significant difference in the mean value of the connectedness score between different groups that can be formed based on the survey responses. The null hypothesis is there is no statistical difference between the mean connectedness scores of members in the two groups, while the alternative hypothesis is the means are statistically different. To examine the effect of membership length,



technology satisfaction and virtual mode on HDR student connectedness, the groups shown in Table 3 are formed and the results of each group's connectedness score are reported.

**Table 2: Questions and results of the adapted student connectedness scale**

Questions	$\bar{X}$	SD
1. I feel that students in this HDR Peer Community care about each other.	4.55	0.60
2. I feel connected to other students in this HDR Peer Community.	4.23	0.81
3. I feel like I can easily communicate with other students about the dissertation.	4.27	0.94
4. I feel like fellow students in this HDR Peer Community are like a family.	3.64	1.00
5. I communicate regularly with other students in this HDR Peer Community.	3.36	1.26
6. I feel I can trust other students in this HDR Peer Community.	4.10	0.70
7. I feel a spirit of community between other students and myself while working on the dissertation.	3.86	0.94
8. I feel like I can rely on other students in this HDR Peer Community for their support.	4.09	0.87
9. I feel like I can easily communicate with other students in this HDR Peer Community.	4.32	0.78

**Table 3: Groups formed for hypothesis testing and results of the connectedness score**

Hypotheses	Groups	<i>n</i>	$\bar{X}$	SD
Hypothesis 1 (H1)	Group 1 (G1): Joined the community for 2 to 4 months	17	4.25	0.52
	Group 2 (G2): Joined for less than 2 months	5	3.33	0.70
Hypothesis 2 (H2)	Group 1 (G1): Satisfied with using the 12 Teams channels for knowledge sharing and collaboration	18	4.20	0.56
	Group 2 (G2): Unsatisfied with the Teams channels	4	3.35	0.82
Hypothesis 3 (H3)	Group 1 (G1): Not concerned by technical issues or lack of desirable features on Teams	13	4.07	0.56
	Group 2 (G2): Discouraged by the Teams problems	9	4.01	0.86
Hypothesis 4 (H4)	Group 1 (G1): Satisfied with using Teams for meetings	12	4.08	0.57
	Group 2 (G2): Unsatisfied with Teams meetings	10	4.00	0.82
Hypothesis 5 (H5)	Group 1 (G1): Unsatisfied with online-only meeting arrangement	13	4.07	0.62
	Group 2 (G2): Satisfied with online-only mode	9	4.01	0.79

The alpha level of .05 was used and the results of Welch's *t*-tests revealed that there is a statistically significant difference in the mean connectedness scores between the two groups in H1 shown in Table 3,  $t(5.37) = 2.75$ ,  $p = .037$ ,  $d = 1.51$ . The statistical power (1- $\beta$ ) is 0.81. For the rest of the hypotheses (H2 to H5), the difference in means for G1 and G2 is not statistically significant ( $p > .05$ ).

The results show that members who have been in the online community for 2 months or more, have significantly higher student connectedness than members who have only joined for less than 2 months, with a large effect size and a high statistical power. It follows that membership length can be identified as a positive factor that affects student connectedness in a HDR CoP, but technology satisfaction and virtual mode were not found to have a significant impact on HDR student connectedness. Although four months is a short time span for a community to fully develop, the findings suggest that a spontaneous CoP can be formed and help HDR students feel connected within months via technology.

## Conclusion

This paper presents the trends and problems of HDR education in Australia, and explores a peer approach to support research students. The case study of the student-initiated community for HDR students shows how a CoP could be developed among HDR students without any design effort from the university and how communication technology could help HDR students achieve connectedness without face-to-face interactions. The results reported in this paper demonstrate and provide insights into how to connect and reconnect students with each other through technology. While this research aims to learn about cultivating a spontaneous HDR CoP within months via technology, future research should examine large HDR communities that have been fully developed online (e.g., on social media and Internet forums) to further understand and foster HDR students' self-initiated communities and collaboration in online environments.

## Acknowledgments

The author wishes to thank the anonymous reviewers and Professor Peter Reimann for their comments, and Dr Elizabeth Black for her professional editorial assistance. Also, special thanks to the members of the HDR Peer Community for their support.

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