



Fostering inclusive and effective doctoral supervisory practice: the Let's Talk About card game

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Abstract

The relationship between doctoral research supervisors and their students is crucial for success during doctoral study. Supervisors face increasing complexity in managing these relationships, compounded by job precarity and the pressure to ensure timely doctoral completion. Equally, doctoral students will navigate a competitive job environment with limited time and funding, exacerbated by structural disparities in gender, race, and class outcomes. Our study explores the need for formalised expectation setting and interpersonal familiarisation within supervisor-doctoral student relationships through the development of the Let's Talk About (LTA) conversation toolkit. LTA was designed with community input, gathering and refining questions from doctoral students and supervisors to explore key areas including expectations, career development, social dynamics, and policy. The toolkit was trialled with supervisor-student pairs, showing significant improvements in understanding and aligning expectations, particularly regarding personal commitments and required support. Results indicated an 81.8% increase in students' perception of their supervisors' awareness of their commitments and a 102.5% increase in supervisors' awareness of students' needs. These findings underscore the importance of structured and inclusive communication tools that foster supportive academic environments. The study highlights the effectiveness of formalised conversation prompts in enhancing communication and understanding in doctoral supervision, leading to stronger, more productive relationships. The integration of LTA into supervisory practices offers a promising solution to key challenges in doctoral education.

Keywords: doctoral supervision; doctoral supervision communication; expectation alignment; mentorship tools; academic relationships; doctoral support.

Introduction

The relationship between doctoral research supervisors and their students is critical for the successful completion of a PhD (Orellana et al., 2016), but these relationships are increasingly disrupted by challenges including job precarity, systemic inequalities, and inadequate training in supervisory practices. The doctoral student-supervisor relationship differs significantly from the teacher–student dynamic in undergraduate (UG) and postgraduate taught (PGT) study. Unlike UG and PGT contexts, where structured curricula and predefined assessments guide learning, doctoral research demands a high degree of autonomy, self-awareness, and collaboration (Sverdlik et al., 2018). Supervisors act as mentors, supporting students through complex research journeys while fostering their scholarly identity (Parker-Jenkins, 2018). This relationship is further shaped by the prolonged duration of doctoral study, reliance on supervisors for academic and career guidance, and the need to navigate personal and systemic challenges.

As the doctoral research landscape evolves, expectations of doctoral student supervisors change with it. The most pressing include an increase in job precarity and pressure to ensure doctoral study completion, alongside a lack of training in navigating the supervisor-doctoral student relationship (Deuchar, 2008; Taylor and Beasley, 2010). Doctoral students face a hyper-competitive job environment upon completion, compounded by time and funding limits. Additionally, rates of ‘positive’ doctoral outcomes are subject to significant gender, race, and class disparities in the UK (Moreau, Hoskins and McHugh, 2024). Alongside these challenges, the neoliberalisation of higher education (HE) brings increased internationalisation and student isolation, opening new pathways for power dynamic imbalances (Morley et al., 2018).

Supervisory best practice differs broadly between departments, HE providers, and academic subjects (Bastalich, 2015), each accompanied by multiple approaches to doctoral supervision (Deuchar, 2008). The contractual model (Taylor and Beasley, 2010) assumes that doctoral student-supervisor pairs must negotiate the extent of support required for successful project outcomes. Equally, Green (2005) argues that successful doctoral supervision requires not just the production of knowledge, but also the production

of an individual doctoral student's scholarly identity. Understandably, asymmetry in expectational understanding between supervisors and doctoral students can contribute to a negative doctoral research experience and research output (Buirski, 2022). Key to both best practice approaches are comprehensive understandings of both the doctoral student's personal circumstances and the structural inequalities they may face resulting from their identity and experiences. This is mirrored by a need for the doctoral student to understand their supervisor's goals, career histories, and supervisory approaches (Huwe and Johnson 2003; Moreau, Hoskins and McHugh, 2024).

It is critical for doctoral students and their supervisors to set expectations around project-specific learning requirements, but this is balanced with an often-unmet need for formalised expectation setting (Bastalich, 2015). There is a clear need for the formalisation of expectation setting and interpersonal familiarisation within supervisor-doctoral student relationships, with the aim to foster an inclusive approach to supervisory practice. This formalisation is crucial at the beginning of the supervisory relationship to ensure each party has a mutual understanding of roles, responsibilities, and expectations (Ives and Rowley, 2005; Wisker and Robinson, 2012). Effective communication and clearly defined expectations can help prevent misunderstandings and conflicts, leading to a more productive and supportive academic environment (Mainhard et al., 2009).

Lack of clear expectations and interpersonal familiarity can lead to negative outcomes, including increased stress, reduced academic performance, and higher attrition rates among doctoral students (Gill and Burnard, 2008; Laufer and Gorup, 2019). Furthermore, fostering an inclusive environment where the diverse needs and backgrounds of students are considered is essential for promoting equity and diversity in HE (Hutchinson and Lawrence, 2017). This approach not only benefits the students, but also enhances the overall quality of the academic experience and research output (McAlpine and Amundsen, 2018).

In addition to clear expectations, a sense of belonging in research is a critical factor influencing the doctoral student experience, as highlighted by Advance HE's Postgraduate Research Experience Survey (PRES) reports (Pitkin, 2020). A lack of belonging can negatively impact doctoral students' academic progress, wellbeing, and overall satisfaction (Gakhal, 2023; White et al., 2024). For many, the isolation inherent in doctoral study, compounded by systemic challenges — such as inequitable access to support networks — undermines abilities to engage fully with their research environment. These trends

underscore the importance of fostering inclusive and supportive supervisory relationships that can help mitigate feelings of disconnection and enhance students' experiences.

Equally, empathy and understanding are fundamental to fostering positive supervisor-student relationships, as they help create a supportive and inclusive environment where students feel valued and respected (O'Meara, Knudsen and Jones, 2013). Supervisors demonstrating empathy are better at recognising and responding to the personal challenges faced by their students, including feelings of isolation or inequity (Buirski, 2022; Polkinghorne et al., 2022). Relational practices are especially important in mitigating the power imbalances inherent in doctoral supervision.

While this study primarily focuses on traditional research doctorates (i.e. research towards fulfilling Doctor of Philosophy degrees), a lack of clear expectations and interpersonal familiarity is also relevant to professional doctorates, including EdD and EngD programmes. Effective communication, expectation setting, and tailored support are equally critical for ensuring successful outcomes in professional doctorates (Lee, 2009; Johansson and Yerrabati, 2017). These programmes, though tailored to practitioners and often differing in structure, share key aspects of the supervisor-student relationship.

Tools that facilitate open communication and the establishment of clear expectations are essential to address these challenges. As such, games and gamified tools have increasingly been recognised as effective interventions for fostering engagement, reflection, and structured dialogue in educational and interpersonal contexts (Alsawaier, 2018). Gamification promotes active participation and motivation and has proven effective in enhancing communication and understanding in academic settings (Hamari, Koivisto and Sarsa, 2014; Chans and Portuguese Castro, 2021).

With the growing complexity of doctoral supervision and the mounting pressure on supervisors to facilitate timely doctoral completions (Taylor and Beasley, 2010), novel approaches are needed. The development of interactive and hands-on game-like intervention presents itself as a useful tool for fostering strong, effective, and inclusive supervisory relationships. Clear communication and mutual understanding are pivotal in creating productive dynamics, as they help to prevent conflicts, build trust, and support academic success (Wisker and Robinson, 2012). Early interventions that focus on setting clear expectations and addressing interpersonal challenges are shown to significantly improve the overall quality of the supervisory experience, benefiting both students and

supervisors (Lundgren and Osika, 2021). To this end, we developed an expectation-setting, inclusion-focused, and conversation-card-based toolkit: 'Let's Talk About' (LTA).

We used a co-created and collaborative process ensuring LTA's development reflected the needs and experiences of doctoral supervisors and doctoral students. Our process gathered input from stakeholders (including doctoral students, supervisors, research culture and development practitioners, and doctoral training programme administrators) to identify and refine key questions addressing expectations, career goals, and inclusion. This helped to ensure the tool's relevance and applicability across diverse supervisory contexts. LTA uses a series of community-curated questions in 'suites', covering expectations, careers, social, policy, and 'wildcard' options. In this paper, we demonstrate how card-based conversation toolkits like LTA are uniquely positioned as tools that use gamification for improving expectations and inclusive considerations between supervisors and their students.

Methods

To develop and evaluate the LTA toolkit, we followed a multi-stage process comprising question development, toolkit piloting, and evaluation. We started by gathering initial questions through an open call, inviting input from doctoral students and supervisors, research culture and development practitioners, and doctoral training programme administrators. These questions were discussed with academic departments and other stakeholders, including STEM student societies and the university's Confucius Institute. The Confucius Institute was consulted to ensure that international cultural differences in supervisory dynamics were considered and that questions were applicable to diverse doctoral and supervisor communities. Following this development stage, we conducted further conversations with supervisors and stakeholders to finalise the question catalogue. The refined toolkit was piloted with supervisor-doctoral student pairs to assess its effectiveness in fostering communication and aligning expectations. Finally, effectiveness was evaluated through Likert-scale questionnaires administered before and three months after using the toolkit, along with semi-structured interviews with a subset of participants. This phased process allowed us to assess both immediate and sustained impacts of LTA as an intervention for expectation setting and inclusivity in doctoral supervision.

Game design

To ensure the relevance of the questions used in LTA, we opened the question-design process to the community. We focused on questions pertaining to Science, Technology, Engineering, and Maths (STEM) subjects, and especially sought questions relating to laboratories, fieldwork, or clinical placements. We invited doctoral students and supervisors to provide prompts. The participants included a mix of home and international students, an approximately equal gender ratio, and representatives from the Colleges of Medical, Veterinary, and Life Sciences and Science and Engineering at the University of Glasgow. Prospective questions were gathered using Microsoft Forms, with 17 additional participants from the University of Glasgow, University of Strathclyde, and University of Bristol responding. The study was conducted at the University of Glasgow, a research-intensive institution with a large PhD cohort (>2500 students). Submissions could be anonymised if required. Questions were open ended, focusing on 'questions they "wished they asked" at the beginning of their research careers and collaboration with a research group'. 66 questions were received.

We evaluated and prioritised submitted questions by assessing their relevance, clarity, and ability to prompt meaningful discussions, consolidating repetitive entries and refining others. Our approach was informed by our collective experience and understanding of effective supervisory practices. Although recruitment efforts focused on STEM disciplines, many submitted questions were not specific to STEM subjects. We have retained the original submission phrasing, but we recognise that the question set has relevance across a wide range of disciplines. Repeated enquiries (e.g. 'How frequently would you prefer meetings to review results, progress, and other matters?') were consolidated into a single question. This resulted in 62 questions. The full list of 62 submitted questions can be found in Appendix 1. Questions were thematically grouped and organised into four suites: 'expectations', encompassing working methods, response times, and meeting schedules for supervisors and doctoral students; 'career', including aspirations, recommended professional associations, and significant conferences; 'social', covering other commitments and personal research anecdotes for supervisors or students; and 'wildcard topics' covering miscellaneous queries. This structure was designed to help participants navigate different areas of the supervisory relationship with more clarity. An example of the card design is shown below in Figure 1.

Special attention was paid to different cultural expectations and norms by engaging with student societies in STEM. This allowed us to explore diverse doctoral student experiences and gather insights on what questions should be included. We met with non-discipline specific supervisors, who participated in online interviews to discuss challenges, review the question catalogue, and provide feedback for refinement.

Figure 1. Example card designs for the Let's Talk About game, including card pack cover (top left), instructions (top row), and different card suits.



Trial design and participant recruitment

Once questions had been collected, ethical approval to run the trial was provided by the University of Glasgow's College of Science and Engineering Ethics Committee (300220115) in April 2023. Open calls within the College of Medical, Veterinary, and Life Sciences and the College of Science and Engineering were used to recruit participants. Equality, Diversity, and Inclusion leads within departments also suggested doctoral student-supervisor pairs who may be willing to participate. Supervisors and doctoral student pairs were required to be within the first year of their doctoral studies and must not have been working together for more than six months. We required a minimum of 45 minutes allocated for the conversation prompted by the cards. Ten doctoral student-supervisor pairs were briefed and provided with information sheets along with consent forms, a set of LTA cards, instructions, and supporting information. Questions for doctoral students and supervisors were developed to assess expectations, research understanding, and interpersonal approaches. These 12 questions were administered before using LTA and again three months later (see Table 1, Appendix 2).

Prior to undertaking the LTA trial, supervisors and doctoral students ranked their familiarity with each other using a series of Likert-scale ranked questions, with a second questionnaire circulated three months after the initial scoring and conversation. To gain deeper insights into participants' experiences with LTA, semi-structured interviews were offered as part of the study. These interviews provided an opportunity for participants to reflect on their use of the toolkit and share their perceptions of its impact on their supervisory relationship. The semi-structured format allowed flexibility in exploring topics relevant to each participant's experience, while maintaining a focus on key themes such as communication and expectation setting. Interviews were conducted online and transcribed for thematic content analysis. This qualitative approach enriched the study by capturing nuanced feedback that could not be obtained through quantitative methods alone. Five additional pairs were recruited for the control group. Our control group did not receive the LTA intervention, but did undertake the Likert-scale questionnaire before and three months after. Semi-structured interview prompts are supplied in Appendix 3.

Game play

The game is initiated by shuffling the deck and drawing question cards, with the student taking the lead in asking the questions. However, there are 'reverse' cards where

supervisors ask students, adding variation to the gameplay. This option was included to balance the dynamic of the discussion, ensuring that both supervisors and students actively contribute to the conversation. Participants can choose from four different ways to play, offering flexibility to suit their preferences. This includes a quick-start guide where cards are drawn and discussions begin spontaneously and an in-depth guide that provides a structured approach focusing on different card suites. Symbols on the cards indicate when questions may be most relevant, such as during the first year of a PhD or in subsequent years. Additionally, there is flexibility to skip irrelevant question cards, ensuring that discussions remain focused and engaging.

Data analysis

To understand any differences resulting from LTA, the Likert-scale questions for both doctoral students and supervisors were transformed into scaled question scores, with a score of one denoting 'strongly disagree' and a score of five indicating 'strongly agree'. These scores were used to quantify changes in perceptions before and three months after the intervention. Comparative analyses were conducted using the Welch's two-sample t-test, a statistical method suited for comparing means between two groups with potentially unequal variances. This test was applied to determine if measured differences between control and intervention groups were statistically significant. In this study, p-values less than 0.05 indicate that the observed changes are unlikely to have occurred by random chance alone, suggesting that the results are statistically significant. Additionally, thematic content analysis was employed to analyse semi-structured interview data, allowing us to identify common themes and gain deeper insights into participants' experiences with the toolkit. This mixed-methods approach ensured that both quantitative and qualitative perspectives were captured.

Results

We used a combination of Likert-rating exercises and semi-structured interviews to evaluate LTA as a toolkit for setting expectations and fostering inclusion between doctoral students and their academic supervisors. Our initial pilot study was conducted between June 2023 and March 2024, involving ten pairs of doctoral students and their academic supervisors at the University of Glasgow. Six supervisors and seven doctoral students

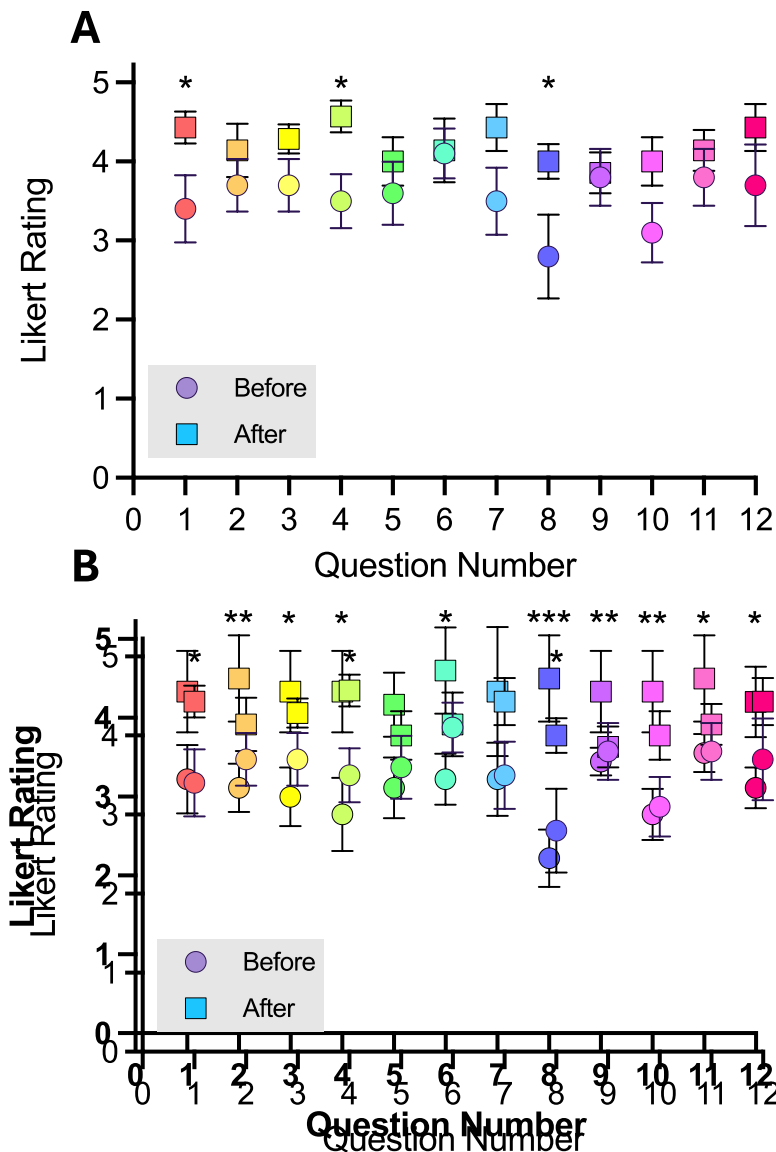
responded to our follow-up survey three months after their initial meeting. A control group, which did not use LTA, consisted of five doctoral student-supervisor pairs. A full list of statistically evaluated question differences is supplied in Appendix 4 (Table 2).

Before and after using LTA, doctoral students and their academic supervisors were supplied with 12 questions designed to assess LTA's effectiveness. The questions (available in Table 1, Appendix 2) considered mutual understanding of research goals and expectations (questions one, two, three, and nine), awareness of support needs and personal commitments (questions four, seven, and eight), and clarity in communication and fostering mutual respect (questions 10, 11, and 12). For example, questions explored topics such as how well supervisors understood their students' research ambitions, how clearly expectations were defined by both parties, and the level of confidence doctoral students felt in approaching their supervisors with concerns. Semi-structured interviews were used to further explore the experiences of those using LTA within this initial trial.

Likert-scale ratings (e.g. one — strongly disagree, three — neutral, and five — strongly agree) were used to quantify experiences of using LTA. When LTA was 'played' between doctoral students and their supervisors, the doctoral students surveyed showed significant improvement in understanding and expectations between themselves and their supervisors across five question categories: research goals and expectations (questions one, two, and three), support needs (question four), and awareness of challenges (question seven and eight; see Table 2a, Appendix 4). Equally, the participating doctoral supervisors showed significant improvement in awareness across the 12 question areas, indicating improved understanding and awareness of their doctoral student's research goals and expectations, support needs, communication needs, and approachability, alongside skill awareness and career aspirations (Table 2b, Appendix 4).

The control group (who did not use LTA), showed minimal differences in scores over the three months. This indicates little to no change in expectations and understanding between doctoral students and their supervisors. Although the control group showed no overall differences, question three in the supervisor group warrants attention. Question three considered doctoral student expectations. It did show a significant difference after three months; however, we believe this is likely due to the time spent working together (Table 1b, Appendix 4).

Figure 2. Averaged agreement levels on Likert-type questions for doctoral students (a) and supervisors (b), with scores from one ('strongly disagree') to five ('strongly agree'). Circles represent 'before' ratings, squares 'after'. Error bars show standard deviation; significant values ($p < 0.05$, $p < 0.01$, $p < 0.001$) are marked (*, **, *).**

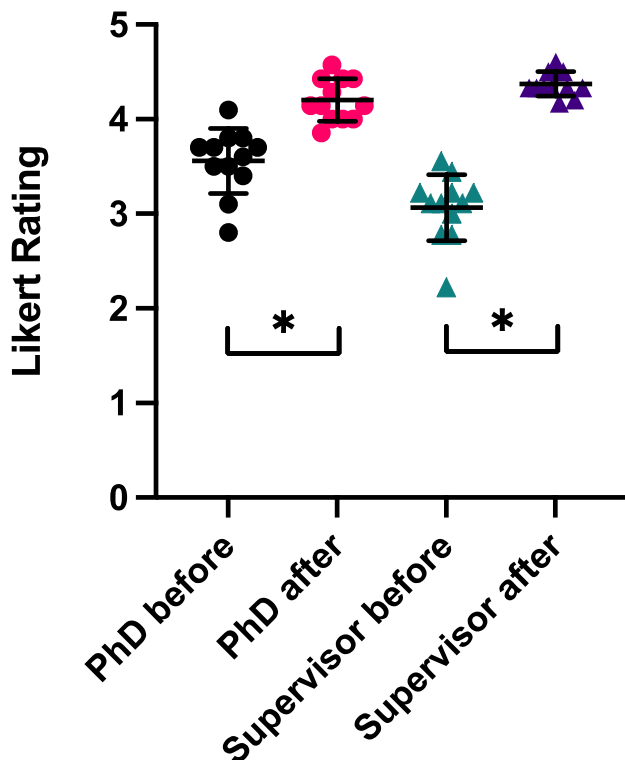


Examining these significant improvements to understanding between doctoral students and their supervisors in more detail, we note doctoral students using LTA reported positive increases across all 12 questions. The most significant positive change ($p < 0.001$) was reported in question eight, 'My supervisor is aware of other commitments I have'. Doctoral students reported that their supervisors now have a greater awareness of their other commitments, with their average scores increasing by 81.8% (Figure 2a) after playing LTA. Additionally, doctoral students using LTA reported a significant increase of 75.8% in their supervisors' awareness of the level of support or guidance required (question four, Figure 2). Further significant improvements were noted in question two (38.1% increase)

and question three (58.7% increase), which consider expectation setting between doctoral students and their supervisors. We also note a 64.2% improvement in doctoral students' perceptions of their supervisors' understanding of their research goals and interests (question one).

Supervisors were asked the same set of 12 questions, reframed to ask about their understanding of their doctoral students (questions can be found in Appendix 2). Using LTA as a doctoral supervisor resulted in statistically significant positive increases across all 12 questions. The biggest improvements are seen in questions considering understanding, support, and expectations between the doctoral student and their supervisor. When considering support and personal commitments (e.g. childcare), doctoral supervisors reported a significant increase ($p < 0.001$) of 102.5% after using LTA (Figure 2b, question eight). Similarly, the supervisors using LTA reported an 88% increase in their awareness of the support and guidance their students require (Figure 2b, question four).

Figure 3. Averaged before-and-after Likert scores across 12 assessment questions. Doctoral students' data are shown with circles, supervisors' data with triangles. Error bars represent standard deviation, and significant values ($p < 0.001$) are marked with asterisks.



LTA fosters improvement in doctoral student-supervisor expectations and awareness. When considering doctoral supervisors' expectations of their students, supervisors using

LTA reported a 62% increase in their clarity of expectations regarding their doctoral student. This is coupled with a 58% increase in their understanding of their doctoral students' expectations of them. These significant improvements indicate a meaningful positive change in alignment and communication between the doctoral supervisors and students.

Taken collectively, the Likert-based analysis of doctoral students and their supervisors show significant positive outcomes from playing LTA at an early stage in the doctoral student-supervisor partnership. We note high average increases across all questions for students and their supervisors, indicating improvements in feedback, expectations, communication, and working relationships. These improvements are complemented by high recommendation scores from doctoral students and supervisors, suggesting LTA is a valuable tool for fostering improved supervisory practice (Table 1). We highlight global before-and-after differences (Likert scores combined and averaged for each question) for both doctoral students and their supervisors in Figure 3.

Table 1. Feedback on the intervention on working relationships between doctoral students (n=7) and supervisors (n=6), where a score of one indicates 'strongly disagree' and a score of five indicates 'strongly agree'.

a) Doctoral student	Mean value
I feel that this game has helped to improve my working relationship with my supervisor.	4.4
I have noticed changes in my supervisors' behaviour or approach since the game.	4.2
I have noticed changes in my own behaviour or approach to working with my supervisor since the game.	4.6
I would recommend this game to other supervisors or doctoral/PhD students.	4.6
This game provided me with a new tool for communicating effectively with my supervisor.	4.6
This game allowed me to better understand my supervisor's expectations.	4.6
b) PhD supervisor	Mean value
I feel that this game has helped to improve my working relationship with my doctoral student.	4.4

I have noticed changes in my doctoral student's behaviour or approach since the game.	4.2
I have noticed changes in my own behaviour or approach to working with my doctoral student since the game.	4.6
I would recommend this game to other supervisors or doctoral students.	4.6
This game provided me with a new tool for communicating effectively with my doctoral student.	4.6
This game allowed me to better understand my doctoral student's needs and expectations.	4.6

To further explore the robustness of the quantitative outcomes and better understand LTA gameplay experiences, we undertook informal, online, semi-structured conversations with participating doctoral students and their supervisors. Two supervisors and three of their doctoral students took part in our interviews. Details of the question prompts used can be found in Appendix 2. These participants found the game 'engaging', 'thought provoking', and facilitative of open communication between paired participants. Our participants appreciated the opportunity to explore often ignored aspects of academic life in a structured yet flexible manner, with interviewees suggesting that LTA can be adapted for a variety of situations and preferences.

Participants explored the importance of flexibility when using LTA within our interviews, noting they appreciated the absence of strict time limits, allowing for more meaningful discussions. One doctoral student stated, 'I liked the flexibility of the game, which allowed me to express my concerns and preferences in a way I would have probably not done without having a question to prompt the conversation'. This positive sentiment was echoed by their supervisor, who expressed the importance of setting expectations right from the beginning of the PhD journey, which in turn instils confidence in students to ask questions and voice their concerns. One supervisor reported that 'the game created a structured and supportive space for having a first guided and supported conversation with my student, that they might have not felt confident to ask certain questions otherwise'. All interviewees noted that LTA was flexible enough to adapt to different communication styles and preferences.

Discussion

This study highlights how LTA can be used as an intervention to enhance communication and understanding between doctoral students and their supervisors. Given the increasing complexity of doctoral supervision and the pressure on supervisors to ensure timely completion of doctoral studies (Taylor and Beasley, 2010), tools like LTA are vital.

The significant improvement in doctoral students' perceptions of their supervisors' awareness of other commitments, with scores increasing from 2.2 to 4.0 (an 81.8% increase), suggests that game-based interventions like LTA can foster empathy and understanding among supervisors. This improvement is mirrored by supervisors' responses, with their awareness of students' other commitments rising from a mean score of 2.2 to 4.5 (a 102.5% increase). Empathy and understanding are critical elements of academic supervision. Huwe and Johnson (2003), for example, emphasise that successful mentorship is key for fostering productive doctoral supervisory relationships. Building on mentorship, Gardner (2008) highlights that successful student adaptation to academic culture requires significant 'socialisation support' from doctoral advisors, ultimately leading to reduced rates of doctoral student attrition. Moreover, empathic supervisors are more likely to appreciate the complexities of their students' personal and professional lives, enabling them to provide tailored support that fosters wellbeing and productivity (Huwe and Johnson, 2003; Fitzgerald et al., 2022). LTA can contribute to an environment in which students feel supported and understood, contributing to their overall wellbeing and academic success (Hirschy and Wilson, 2002). An increase in academic and personal wellbeing is important, especially as academic employment continues to be precarious and students face numerous intersectional disparities (e.g. race, gender, class, disability) (Moreau, Hoskins and McHugh, 2024).

The intervention's effectiveness in improving communication and aligning expectations between supervisors and students is evident from the improvements in expectation metrics. Doctoral students reported a positive impact on their perception of supervisors' understanding of their research goals and interests, highlighting the intervention's role in enhancing the mentorship aspect of doctoral education. Effective communication is critical for the academic and long-term success of doctoral students, as it helps in setting realistic expectations for successful mentorship and doctoral students' subsequent journeys (Walker et al., 2009; Bagakas et al., 2015). This is particularly important as misalignments in expectations can lead to negative experiences and degree outcomes (Golde and Dore,

2001; Parker-Jenkins, 2018). Indeed, we hope that as students and their supervisors have an equal number of questions and given that the process is initiated by the student, LTA helps to foster doctoral student autonomy and underlines the importance of equal partnerships.

Supervisors also showed notable improvements in their awareness of the pastoral support and guidance their students require (e.g. question four, challenging family situations, signposting to university support resources). Recognising and responding to these needs is essential for fostering a productive and supportive academic relationship, as inadequate support is a significant factor in doctoral attrition (Van Rooij, Fokkens-Bruinsma and Jansen, 2019; Wollast et al., 2023) and supportive supervision is crucial for student persistence (Sverdlik et al., 2018; Al Makhamreh and Stockley, 2020). To address these needs throughout the doctoral journey, the LTA toolkit includes cards coded to different stages of the doctoral student's journey, enabling conversations to be adapted as circumstances and priorities evolve. This improved awareness of support needs can lead to more tailored and effective guidance, ultimately enhancing the doctoral experience and promoting successful outcomes.

The formal feedback provided indicates that the game effectively facilitated changes in behaviour and approach amongst doctoral students and supervisors. High recommendation scores from both groups highlight the perceived value and utility of the game as a tool for enhancing communication, understanding expectations, and strengthening the supervisor-student relationship. Informal feedback further supports these findings, with participants noting that the game was engaging and conducive to open communication, especially when addressing challenging questions. The ability to accommodate a range of communication styles contributes to more meaningful and productive interactions, which is crucial for fostering an inclusive academic environment where students can succeed (Golde and Dore, 2001; Johansson and Yerrabati, 2017). While LTA encourages openness and shared understanding, we recognise that it does not yet explicitly address the inherent power imbalance in doctoral supervision. Future developments of the toolkit will aim to include prompts that support student autonomy, setting boundaries and highlighting strategies for navigating conflict to further empower doctoral students within these relationships.

Moreover, we note that while we only solicited questions from those working and studying in STEM subjects, many of the questions were applicable across all subjects. We are keen

to work to expand our question set to include specific questions for the Humanities, Arts, and Social Sciences. With further modification to questions (e.g. a broadening away from laboratory-specific language), LTA or similar card-based conversational interventions could be suitable for non-academic onboarding processes, too. We also note that this study would be further enhanced by undertaking longitudinal analysis on doctoral outcomes and experiences between the student-supervisor pairs, and we are keen to explore these in the future. Future studies could also explore whether different gameplay formats (e.g. quick start versus the other three options) influence participant outcomes, as this was not examined in detail in the current study.

Based on participant feedback, future development of the LTA toolkit could include aligning discussion prompts more closely with university values and integrating the tool into group settings, such as research meetings, to foster collective awareness and cohesion. While this study focused on participants from STEM disciplines, many of the submitted questions were not subject-specific, suggesting that LTA has strong potential for adaptation across a broader range of academic fields. However, future trials in Humanities, Arts, and Social Sciences (HASS) contexts are needed to assess its effectiveness in those areas. Suggestions from participants for app-based development also highlight the potential to increase accessibility and usability. As generative AI continues to evolve, future iterations of LTA could also incorporate new questions that respond to emerging issues in doctoral education, such as issues related to AI-generated content and academic integrity.

While some questions submitted touched on sensitive topics, such as institutional power or financial pressure, we acknowledge that LTA in its current form does not directly facilitate conversations about power imbalances or the cost of living. We recognise that questions explicitly addressing power dynamics, such as those related to decision-making, feedback, and conflict resolution were limited in this initial version. Future iterations of the toolkit will explore how to introduce these themes in a way that supports open discussion while remaining appropriate for professional academic settings. We acknowledge that the small sample size, particularly the reduced number of participants in follow-up interviews, is a limitation. While these findings are promising, further research with a larger and more diverse sample is needed to evaluate the broader applicability of the toolkit. Our focus on STEM participants may also limit generalisability across academic disciplines.

Conclusion

The LTA intervention proves to be an effective tool for enhancing communication and understanding between doctoral students and their supervisors. By fostering empathy, aligning expectations, and addressing support needs, LTA creates a more inclusive and supportive academic environment. The toolkit's structured yet flexible design allows it to facilitate meaningful conversations that address challenges unique to the doctoral journey, such as navigating personal commitments, power imbalances, expectations, and, more recently, the cost of living.

The findings demonstrate the value of intentional, formalised tools in bridging gaps in communication and setting expectations, highlighting their potential to improve academic outcomes and doctoral students' wellbeing. Supervisors gain deeper insights into the lived realities of their students, enabling them to provide tailored support, while students benefit from clearer guidance and a stronger sense of belonging in their academic community.

Although the questions were community-generated and thus not designed to target specific theoretical constructs, we note that creating space for open and inclusive conversations around expectations may play an important role in supporting the development of students' scholarly identity. Empowering students to voice concerns and clarify expectations can contribute to greater confidence and belonging within their academic discipline.

Expanding the use of LTA to other contexts, such as professional doctorates and interdisciplinary research groups, could further enhance its impact. Additionally, embracing technological innovations, such as app-based versions of the toolkit, could increase accessibility and adaptability, reaching a broader audience across diverse academic and professional settings. These findings underscore the critical need for integrating structured, empathetic, and inclusive practices into supervisory relationships to create stronger, more supportive academic environments that empower students and supervisors alike.

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Matt Jones is a photobiologist, exploring how plants integrate light signals to optimise responses to abiotic stress. After undertaking a PhD at Glasgow researching phototropin activation, he joined UC Davis to study circadian modulation of light responses, identifying RVE1, RVE8, and JMJD5 as key components. At the University of Essex, supported by a Leverhulme Fellowship, he developed chlorophyll fluorescence methods and studied RNA processing and metabolism in circadian timing, identifying stress-induced metabolites which modulate gene expression. Since 2019, his lab in Glasgow investigates how circadian and light signalling pathways interact to enhance plant resilience to environmental change. Matt was the Equity, Diversity, and Inclusion academic lead in the School of Molecular Biosciences throughout the Let's Talk About project.

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Appendix 1: full list of questions submitted by theme

Career

1. What do you see as possible next steps for you?
2. What are you most excited about or concerned about in this field?
3. If you were in the job market tomorrow, what would you do?
4. How do you keep skills current? What do you read? What professional associations do you belong to?
5. Looking at my CV, what advice would you have on the next steps if I were interested in a career in this sector or with this company?
6. Are there any training courses that you feel would be more beneficial than others for my PhD journey?
7. How can I better tailor my experience to prepare me for a future in industry/research/academia?
8. Are there any conferences or events I can attend to meet other people working within my field?
9. What do you want to gain from doing a PhD?
10. What are your concerns about the PhD journey?
11. What seminars or continuing education do you consider useful?
12. In your view, what are the main career options in this field?
13. How can we work together to make sure my career aspiration can be supported by this work (e.g. are there any internships we can seek out)?
14. Reverse (PhD supervisor asks): What is your ultimate career goal in doing this PhD? How can I support you in this or in finding out?
15. What skills do you find are the most important for a PhD student to have and to acquire over time?
16. Reverse (PhD supervisor asks): Are there any skills you feel you are currently lacking or need support?
17. What aspects of your career have you found most and least rewarding — and why?
18. What would you do differently if you were starting again?
19. Reverse (PhD supervisor asks): PhDs are excellent opportunities to widen horizons — how could you throughout the PhD make sure to engage with different people/institutions/topics?
20. Do you know what your goal is overall?
21. Are there any places you would like to visit for work and why?

Expectations

1. How often should we meet?
2. How should we communicate?
3. What are the expectations in terms of deadlines/submissions of work?
4. What are the expectations in terms of turnaround/feedback time?
5. What are the expectations regarding my office/lab/on-campus attendance (discussion around presenteeism)?
6. What kind of status update would you be looking for?
7. What is your supervision style (i.e. hands-on/hands-off, mentor/manager/colleague)?
8. When/during what times should we communicate?
9. Where do we communicate/what spaces are appropriate to meet?
10. Might other responsibilities impact the way you work or your availability (e.g. care responsibilities)?
11. If I feel that I want to change my supervisor what is the correct process to follow?
12. If you are absent due to holidays or illness, who should I contact if I have any questions or need advice?
13. What are your expectations in terms of my attendance at seminars, training sessions, and school/lab meetings?
14. How many hours a day on average do you expect me to be present in the lab/office?
15. How many hours would be acceptable for me to work from home?
16. What practical work am I expected to do?
17. What are your thoughts on the benefits/concerns around hybrid working?
18. What are some of the challenges other students have experienced starting a PhD and how have they navigated this?
19. How does a PhD differ from an undergraduate degree?
20. How closely will we be working together on experiments/surveys/data collection?
21. What time off am I entitled to (e.g. holidays, sickness, parental leave)?
22. Do you know what you need to do until the next meeting?
23. Are there any commitments you have that I should know about?
24. If you are ever unavailable who can I contact if I have any issues?
25. What is your supervisory style?
26. What are the key requirements I must complete at different stages (e.g. progress reviews or official submissions)?

Policy

1. If you have any support needs such as for dyslexia, neurodiversity, or mental health please register with our Disability Service and do let me know how I can help.
2. What are important policies I should be aware of (provide examples)?
3. Where can I access information on financial support should I need to?
4. What university policies should I be aware of and why is this important?
5. Gender-based violence is common across UK campuses. What makes universities environments that may lead to this pattern?
6. Where can I find the student handbook and why is this important?
7. What are the key requirements I must complete at different stages (e.g. progress reviews or official submissions)?

Social

1. If you have any support needs such as for dyslexia, neurodiversity, or mental health please register with our Disability Service and do let me know how I can help.
2. Where can I access support for mental health? Do you have any experience or insight in these services (to destigmatise/share stories)?
3. What are important policies I should be aware of?
4. Where can I access information on financial support should I need to?
5. What university policies should I be aware of and why is this important?
6. Are you comfortable working with the other members of your group?
7. What was one of the most memorable lab/field experiences you had?
8. Who was the most exciting person you were able to meet through your job?
9. What was a major challenge in the lab/field and how did you manage to overcome it?
10. Gender-based violence is common across UK campuses. What makes universities environments that may lead to this pattern?
11. What is your preferred data management system (e.g. OneDrive, JDrive, Teams)?
12. Are you married to anyone (or a question to the effect that allows scoping of internal relationships/allegiances)?
13. How can you support me in managing stress?
14. Where can I find the student handbook and why is this important?

Appendix 2: questions used to evaluate effectiveness of LTA as an intervention

Table 1. The 12 questions presented to supervisor-student pairs before playing Let's Talk About and three months after playing.

Num.	a) Doctoral student question
1	My supervisor has a good understanding of my research goals and interests.
2	My supervisor's expectations of me are well defined.
3	My expectations of my supervisor are well defined.
4	My supervisor is aware of what level of support/guidance I require.
5	My supervisor knows how to support me effectively.
6	I am aware of the skills I needs to work on.
7	I am aware of challenges I might experience during my PhD.
8	My supervisor is aware of other commitments (e.g. childcare) I have.
9	My supervisor understands my career ambitions.
10	I feel that I know my supervisor relatively well.
11	The level of communication between me and my supervisor is satisfactory.
12	I feel confident to approach my supervisor with questions or concerns.
b) Supervisor question	
	I feel like I have a good understanding of my doctoral student's research goals and
1	interests.
2	My expectations of my doctoral student are well defined.
3	My doctoral student's expectations of me are well defined.
4	I am aware of what level of support/guidance my student requires.
5	I know how to support my student effectively.
6	I am aware of the skills my student needs to work on.
7	I am aware of challenges my student might experience during their doctorate.
8	I am aware of other commitments (e.g. childcare) my student has.
9	I understand my student's career ambitions.
10	I feel that I know my student relatively well.
11	The level of communication between me and my doctoral student is satisfactory.
	I feel confident that my doctoral student would approach me with questions or
12	concerns.

Appendix 3: semi-structured interview prompts for qualitative analysis ***semi-structured interview questions***

- Describe your overall experience with the game. What aspects were most engaging or thought-provoking?
- How clear and easy to follow were the instructions?
- Were there moments where additional guidance was needed?
- Did you appreciate the absence of strict time limits, or would suggested timeframes help?
- What additional instructions or features would help align the game with institutional values?
- If you could change any aspect of the game, what would it be?
- Would you recommend this game to other research teams? Why or why not?
- Anything else you would like to share about your experience?
- Any thoughts?

For doctoral students:

- How did the game help you express concerns and preferences within your research group?
- What aspects made you feel comfortable discussing expectations and goals?
- Any modifications that would make the game more beneficial for PhD or doctoral students?

For supervisors:

- How did the game support setting expectations and fostering student confidence?
- Did it help you understand different communication styles or student preferences?
- Would prompts addressing common PhD or doctoral challenges be helpful? What topics should they cover?

Appendix 4: statistical differences between test and control groups for Let's Talk About doctoral student and supervisor pairs

Table 2. Level of agreement on Likert-type scale questions for doctoral students (a) and supervisors (b), with scores ranging from one (strongly disagree) to five ('strongly agree'). Data show pre- and post-intervention responses for the test and control groups, with significant values highlighted in bold. Significance was determined using Welch's paired two-sample t-test, p<0.05.

a) Doctoral student question							
		Mean score			Mean		
Question	Group	Before	After	Mean change	Mean % change	t-value	p-value
1	Test	2.7	4.4	1.73	64.02	-4.78	>0.001
	Control	3.0	2.8	-0.20	-6.67	0.34	0.741
2	Test	3.0	4.1	1.14	38.10	-2.68	0.020
	Control	3.2	3.6	0.40	12.50	-0.73	0.486
3	Test	2.7	4.3	1.59	58.73	-3.86	0.002
	Control	3.6	3.8	0.20	5.56	-0.37	0.725
4	Test	2.6	4.6	1.97	75.82	-5.38	>0.001
	Control	3.6	3.0	-0.60	-16.67	1.18	0.275
5	Test	2.7	4.1	1.44	53.44	-3.92	0.001
	Control	3.8	3.6	-0.20	-5.26	0.45	0.668
6	Test	4.1	4.3	0.19	4.53	-0.44	0.668
	Control	3.4	3.6	0.20	5.88	-0.25	0.807
7	Test	2.8	4.4	1.63	58.16	-3.49	0.003
	Control	3.0	3.6	0.60	20.00	-0.80	0.446
8	Test	2.2	4.0	1.80	81.82	-4.58	>0.001
	Control	2.4	2.4	0.00	0.00	0.00	1.000
9	Test	3.1	3.9	0.76	24.42	-1.99	0.065
	Control	3.6	3.6	0.00	0.00	0.00	1.000
10	Test	3.1	4.0	0.90	29.03	-1.84	0.085
	Control	3.0	3.2	0.20	6.67	-0.41	0.694
11	Test	3.4	4.1	0.74	21.85	-1.99	0.066
	Control	2.6	3.4	0.80	30.77	-1.11	0.299
12	Test	3.7	4.4	0.73	19.69	-1.22	0.243
	Control	2.8	3.0	0.20	7.14	-0.41	0.694

b) Supervisor question							
		Mean score			Mean		
Question	Group	Before	After	Mean change	Mean % change	t-value	p-value
1	Test	3.1	4.3	1.22	39.29	-2.59	0.025
	Control	2.8	2.6	-0.20	-7.14	0.32	0.761
2	Test	2.8	4.5	1.72	62.00	-4.83	>0.001
	Control	2.4	3.0	0.60	25.00	-0.88	0.403
3	Test	2.8	4.3	1.56	56.00	-4.02	0.002
	Control	1.8	3.4	1.60	88.89	-2.92	0.019
4	Test	2.4	4.3	1.89	77.27	-4.74	>0.001
	Control	2.6	3.0	0.40	15.38	-0.53	0.608
5	Test	2.7	4.2	1.50	56.25	-5.20	>0.001
	Control	2.8	3.0	0.20	7.14	-0.34	0.741
6	Test	3.0	4.5	1.50	50.00	-4.62	0.001
	Control	2.8	3.4	0.60	21.43	-1.34	0.229
7	Test	2.8	4.3	1.56	56.00	-2.98	0.011
	Control	2.2	2.8	0.60	27.27	-1.13	0.290
8	Test	2.2	4.5	2.28	102.50	-5.33	>0.001
	Control	1.8	2.6	0.80	44.44	-1.79	0.117
9	Test	3.3	4.3	1.00	30.00	-3.72	0.004
	Control	3.2	3.4	0.20	6.25	-0.63	0.545
10	Test	2.8	4.3	1.56	56.00	-4.02	0.002
	Control	2.6	2.4	-0.20	-7.69	0.28	0.789
11	Test	3.1	4.5	1.39	44.64	-4.04	0.001
	Control	3.0	3.4	0.40	13.33	-0.78	0.457
12	Test	2.9	4.3	1.44	50.00	-4.31	0.001
	Control	2.8	3.0	0.20	7.14	-0.53	0.610

Appendix 5: outcomes of informal peer review at AdvanceHE's 2024 EDI conference

To further understand perceptions and usability of Let's Talk About, a mini peer assessment was undertaken at Advance HE's Equality Diversity and Inclusion Conference (Liverpool, 2024). The participants included a mix of academics, educational developers, and professionals working in HE, rather than only doctoral students and supervisors. This broader audience provided valuable perspectives on the adaptability of LTA in other disciplines and contexts. Twenty-four participants played Let's Talk About in an interactive workshop session lead by the authors, with sentiment and experience assessed at the end using the interactive tool Mentimeter. This allowed collection of qualitative and quantitative feedback from those working beyond STEM areas that were participating the card design and trial. Participants strongly agreed that LTA captured nuances of communications and expectations in academia (4.3/5) and strongly agreed that the game was enjoyable (4.7/5). 62.5% of participants (n=15) would play the game again, while 37.5% (n=9) would do with modifications. Participant suggested modifications to LTA include expanding the questions away from STEM and into Humanities, Arts, and Social Sciences (HASS).