REFLECTIONS ON PRACTICE

Interdisciplinary Collaboration: A Pharmacy and Academic Literacy Initiative

[1]LEE Kooi Cheng, [1]WU Siew Mei, [1]Misty So-Sum WAI-COOK, and [2]ONG Pei Shi

[1]Centre for English Language Communication (CELC), National University of Singapore (NUS)
[2]Department of Pharmacy, Faculty of Science (FoS), NUS

Correspondence:

Name: Associate Professor LEE Kooi Cheng
Address: Centre for English Language Communication, 10 Architecture Drive, #02-21, Singapore (117511)
Email: elcleekc@nus.edu.sg

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ABSTRACT

In this reflective piece, we share an evidence-based five-year interdisciplinary collaborative effort in enculturalising final year pharmacy student researchers into their disciplinary community and related sub-communities. The coherence between content knowledge and academic literacy is facilitated through making explicit inter-connectedness of materials, tasks and activities; rubrics that discern areas of focus to be assessed by content and academic literacy instructors; and meaningful and instructive feedback supporting student growth. We recognise that this shift towards embedding is a major departure from conventional curriculum design where the teaching of academic literacy is done in isolation from disciplinary content. Nonetheless, despite the challenges, we have found a harmony that illustrates student-centredness in learning, assessment, and curriculum design.

Keywords: Embedded curriculum, interdisciplinary collaboration, student-centred, feedback-focused

BACKGROUND

In Academic Year 2017/18, the Scientific Communication for Pharmacy Final Year Project module was jointly developed and introduced by the Department of Pharmacy and Centre for English Language Communication (CELC) at the National University of Singapore (NUS). There are two primary aims for this module: (a) to develop students' disciplinary research knowledge through taking on a one-semester research project; and (b) to effectively present the research project, written and spoken, to their domain experts. This exercise is intended for students to be socialised into their disciplinary community.

In order to facilitate a strong coherence between content knowledge and academic literacy, the embedded curriculum that makes explicit connections between disciplinary knowledge and discourse was adopted as the approach to teaching and learning (Williams & Allan, 2014). This means the teaching and learning materials are disciplinary-specific, tasks and activities are directly linked to the disciplinary content, academic discourse is contextually situated (Wingate, 2015), and assessment rubrics are intentionally and carefully crafted so that dimensions graded by pharmacy and academic literacy instructors complement each other.

The embedded curriculum is a collaborative framework that has been widely used in the teaching of academic writing in higher education since the 2010s to address demands of the 21st century interdisciplinary academic and workplace contexts (Johnson et al., 2015). The root of this collaborative framework lies in close partnership between domain and academic literacy instructors to co-design an integrated curriculum. In practice, such a collaboration requires multiple conversations between these colleagues, an openness to making necessary accommodations, a genuine respect for each other's disciplines, and an explicit articulation of the approach to students. While the embedded curriculum is philosophically attractive, its implementation implies a mindset shift requiring new competencies for faculty members, and challenges in reaching consensus on teaching approaches and power dynamics (Jacobs, 2007; Arkoudis & Starfield, 2007 as cited in Johnson et al., 2015). Despite these, the benefits to student learning make this collaborative effort between domain and academic literacy instructors a worthwhile pursuit.

Ensuring interconnectedness of materials, tasks and activities, and assessment rubrics arising from close collaboration between disciplinary and academic literacy experts is only one criterion for the embedded curriculum to be effective; student-centredness is another important criterion (Williams & Allan, 2014). We contend that student-centredness means addressing the learning needs of students in their enculturation into the disciplinary community as novice researchers. One way to do so in the context of individualised final year projects (FYPs) is through scaffolding of students' learning process (Bruffee, 1993) via a feedback-focused approach. Each student works with his/her pharmacy supervisor(s) and his/her academic literacy instructor who provide individualised guidance, as well as purposeful and thought-provoking feedback at the research project's different milestones.

In short, the embedded approach requires close collaboration between the domain and academic literacy instructors to ascertain effective student learning and meaningful student experience. We share our reflection with evidence of impact after five years of collaboration.

REFLECTIONS

Deliberate effort has been made to create an environment supportive of developing students as researchers and members of their disciplinary community. To strengthen the embedded curriculum and disciplinary specificity (Hyland, 2017), students are placed in respective groups according to their categories of research project directions, namely Pharmacokinetics, Pharmaceutical Chemistry, Pharmacy Practice, and Pharmaceutical Technology. Each research direction provides tailor-made materials so that students learn

critical elements such as synthesising readings to make an argument for a research gap, analysing and consolidating findings, discussing implications, appropriately referencing other studies, critically identifying and articulating the significance of research, and using appropriate academic conventions and register. The finer differentiations amongst pharmacy sub-disciplines and their requirements on writing conventions are worked into the curriculum, where it is possible and appropriate to do so. This facilitates students' awareness of nuances and conventions as members of sub-disciplinary groups.

We reflect on this embedded approach through three aspects that demonstrate integration of disciplinary knowledge and academic literacy: (1) materials, tasks and activities; (2) assessment rubrics with a focus on the research report; (3) complementary feedback given by both pharmacy and academic literacy instructors, and the improvements observed from and illustrated using a student's drafts.

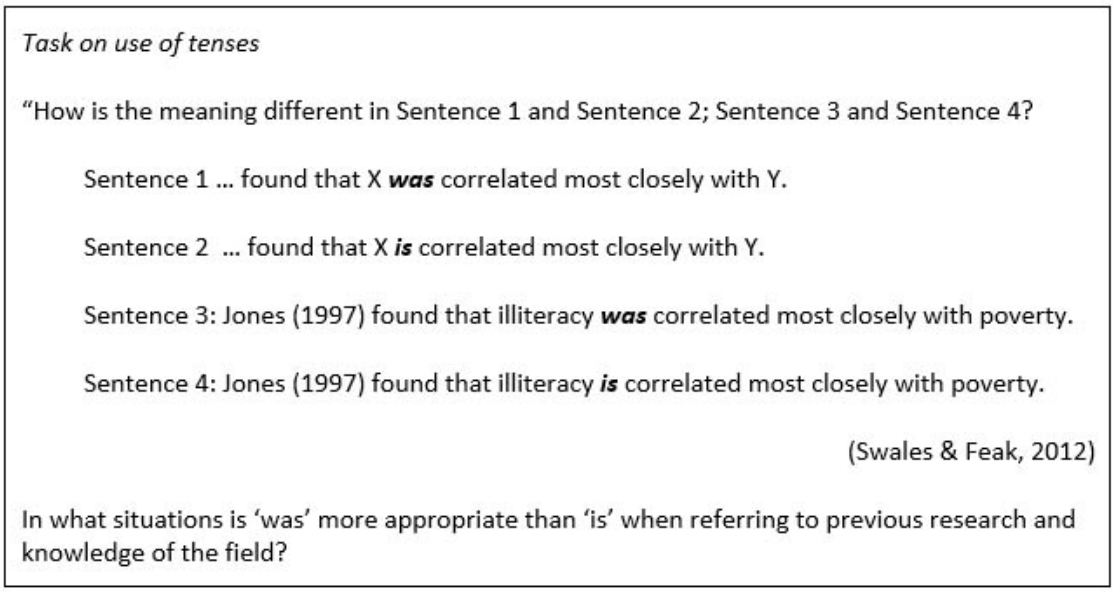
Interconnectedness through materials, tasks and activities

Collaborative effort is observable in the design and implementation of materials, tasks and activities which are based on elements distilled, as discussed earlier, to be critical to student learning and experience. For example, Pharmacy's requirement for the Introduction of a research report indicates:

> "This section must contain a clear statement of the aims of the work or of the hypotheses being tested. A brief account of the relevant background that supports the rationale of the study should also be given. The length of the Introduction should not exceed 750 words."

The academic literacy instructors further explain this based on the expectations of the disciplinary community. Complementing the quality of disciplinary content in the Introduction is the sophistication of the writer's voice, stance, and argument through how (a) purpose and support are established; (b) sources are integrated; (c) language is used; and (d) rhetorical moves are applied. These elements are highlighted and analysed in the academic literacy class to enhance students' articulation of their research.

Here, we offer an illustration. One of the most important linguistic features in expressing the voice of a writer in the Introduction is the *choice of verb tense*. This is especially so when citing others' research to establish either context or credibility. The academic literacy session may start with a simple discussion of the following task (Figure 1). It then proceeds to an analysis of selected articles—some excerpts provided by disciplinary experts and at least two through students' own selection.


Task on use of tenses

"How is the meaning different in Sentence 1 and Sentence 2; Sentence 3 and Sentence 4?

Sentence 1 … found that X ***was*** correlated most closely with Y.

Sentence 2 … found that X ***is*** correlated most closely with Y.

Sentence 3: Jones (1997) found that illiteracy ***was*** correlated most closely with poverty.

Sentence 4: Jones (1997) found that illiteracy ***is*** correlated most closely with poverty.

(Swales & Feak, 2012)

In what situations is 'was' more appropriate than 'is' when referring to previous research and knowledge of the field?

Figure 1. Task on use of tenses in Introduction.

Learning (or lack of) can be seen from students' assignments. Figure 2 is an excerpt of an Introduction from a student's research report which shows the student's choice of tenses to differentiate between facts and reporting of studies.

> Andrographolide is a promising natural ent-labdane diterpenoid isolated from the traditional medicinal plant Andrographis paniculata that has been found to possess diverse therapeutic properties, including anticancer, anti-inflammatory and antiviral.[11] In 2015, Wintachai et al. identified Andrographolide as an initial hit for CHIKV inhibition through phenotypic cell-based screening, possessing moderate in vitro CHIKV inhibitory activity (IC50 = 77.4 μM).[12] Subsequently, a library of 67 Andrographolide derivatives screened by our group led to the discovery of ent-labdane oxindole-Andrographolide 1, with the original β-hydroxy-γbutyrolactone system replaced with an oxindole system, which possessed significantly increased in vitro CHIKV inhibitory activity (IC50 = 5.5 μM).

Figure 2. Introduction section of report.

(1) Assessment rubrics–research report

Developing complementary marking rubrics for content and academic literacy is further key evidence of collaborative effort. This is also ***the*** main challenge encountered by pharmacy and academic literacy instructors, as the alignment of criteria requires detailed and thoughtful consideration of assessment principles.

For two years since the implementation of the module in AY2017/18, there was an overlap of two main components of the written research report and oral exam marking descriptors, namely content and organisation. For example, in the research report descriptors for content, "comprehensiveness of content and strength in arguments" is required. The difference between how the pharmacy and academic literacy instructors interpreted 'content' resulted in students receiving conflicting feedback for the same assignment.

To address this, descriptors were reviewed and revised in AY2019/20 to reflect pharmacy and academic literacy expertise. Using again the research report descriptors as examples, content is now assessed solely by the pharmacy instructors as domain experts. They look at the quality of report in relation to robustness of research design and strength of analysis and appraisal. The academic literacy instructors, on the other hand, assess the same research report on the degree of sophistication in students' strategic use of language to convey their stance, voice and argument through the articulation of purpose and support, resources, language, and design, formatting, organisation and conventions.

(2) Effective feedback strategies to motivate and support students' learning and growth

The third evidence of impact of this collaborative effort is feedback to students. Based on the revised materials and assessment rubrics, the team scaffolds learning by providing students timely, constructive, and individualised feedback that highlights the strengths and gaps in students' disciplinary knowledge and academic literacy. In addition, concerted effort is made to ensure comments are comprehensible and actionable, and students are given dialogic, one-on-one conferencing sessions with their respective pharmacy and academic literacy instructors to seek clarification (Carless, 2013; Hattie & Temperley, 2007; Opitz et al., 2011; Vattøy et al., 2020).

To show how students may benefit from this experience, one student's research report drafts illustrate feedback given by academic literacy and pharmacy instructors, respectively.

Figures 3 and 4 show excerpts of the student's first draft of the Introduction. The student listed ideas on tools and measurements for anticholinergic adverse effects without linking ideas across sentences, and did not strengthen claims by appropriately integrating, synthesising, and evaluating relevant sources, which led to the incoherent development of the research gap and study significance. These were raised for the student's consideration, as observed in Comment1, Comment2 (Figure 3) and Comments3 i-iv (Figure 4) by the academic literacy instructor.

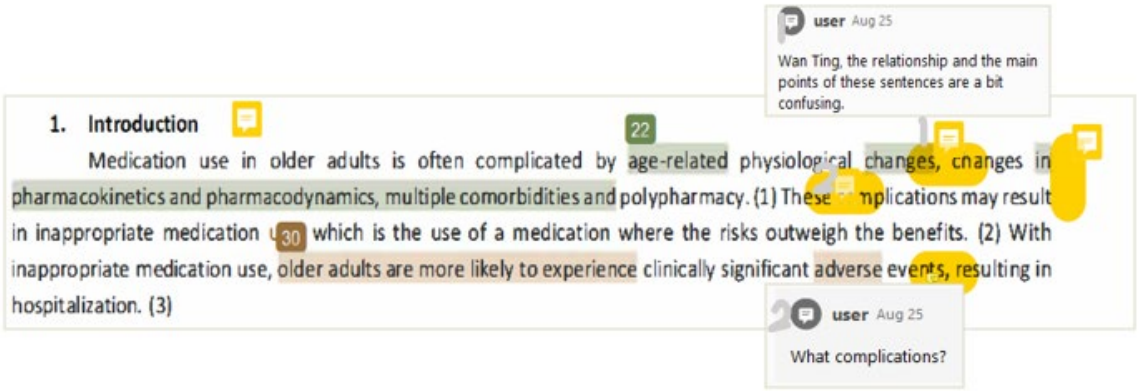
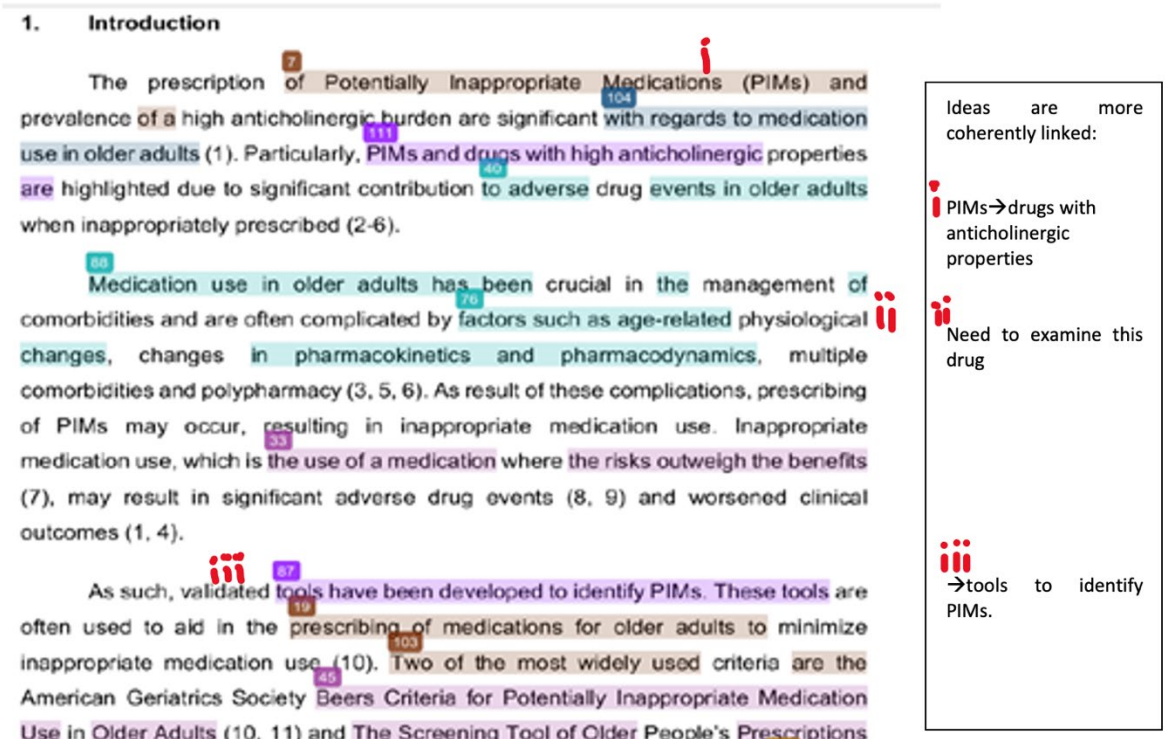


Figure 3. Student's FYP Report Draft1.

Figure 4. Student's FYP Report Draft1.

The pharmacy instructor reinforced separately that the Introduction draft had failed to illustrate the interconnectivity of ideas between inappropriate medication use and anticholinergic side effects associated with the inappropriately prescribed medications in older adults (Figures 3 and 4). This lack of coherence in ideas made subsequent presentation of validated tools fragmented, resulting in a failure to clearly articulate the research gap and rationale for this work.

The impact of this synergistic approach to materials and rubrics revisions can be seen as the student benefitted from both sets of complementary comments. The student's final research report draft shows the ability to clearly present the main focus of the topic, link ideas more coherently with accurate use of language, develop ideas sufficiently with relevant sources, and succinctly evaluate sources to logically develop a clear rationale of the topic (Figure 5). It is observed that the student could distil and amalgamate feedback from both pharmacy and academic literacy instructors effectively.



1. **Introduction**

The prescription of Potentially Inappropriate Medications (PIMs) and prevalence of a high anticholinergic burden are significant with regards to medication use in older adults (1). Particularly, PIMs and drugs with high anticholinergic properties are highlighted due to significant contribution to adverse drug events in older adults when inappropriately prescribed (2-6).

Medication use in older adults has been crucial in the management of comorbidities and are often complicated by factors such as age-related physiological changes, changes in pharmacokinetics and pharmacodynamics, multiple comorbidities and polypharmacy (3, 5, 6). As result of these complications, prescribing of PIMs may occur, resulting in inappropriate medication use. Inappropriate medication use, which is the use of a medication where the risks outweigh the benefits (7), may result in significant adverse drug events (8, 9) and worsened clinical outcomes (1, 4).

As such, validated tools have been developed to identify PIMs. These tools are often used to aid in the prescribing of medications for older adults to minimize inappropriate medication use (10). Two of the most widely used criteria are the American Geriatrics Society Beers Criteria for Potentially Inappropriate Medication Use in Older Adults (10, 11) and The Screening Tool of Older People's Prescriptions (STOPP) (12). These criteria consist evidence-based lists of PIMs which should be avoided by older adults (10-12).

Specifically, medications with anticholinergic properties are studied in these criteria due to the significance anticholinergic drugs have in the therapeutics of older adults (13) and significant side effects exhibited by anticholinergic drugs on older adults (3, 5, 6). As a result, anticholinergic drugs are often highlighted as PIMs and

Ideas are more coherently linked:

i PIMs→drugs with anticholinergic properties

ii Need to examine this drug

iii →tools to identify PIMs.

Figure 5. Student's FYP Report Final Draft.

Not only did the student make improvements to the Introduction, transfer of knowledge can also be observed from the same student's Discussion section of the research report (Figure 6), where the student competently applied what was learned independently without further assistance. In this excerpt, after the student presented statistics to show the prevalence of anticholinergic burden among older adults in Singapore (see Figure 6, Move 1), the student explained the differences and drew comparisons with finds in the literature (see Figure 6, Moves 2-3). The student then expressed 'voice' by evaluating the meaning of results with reference to the literature (see Figure 6, Move 4).

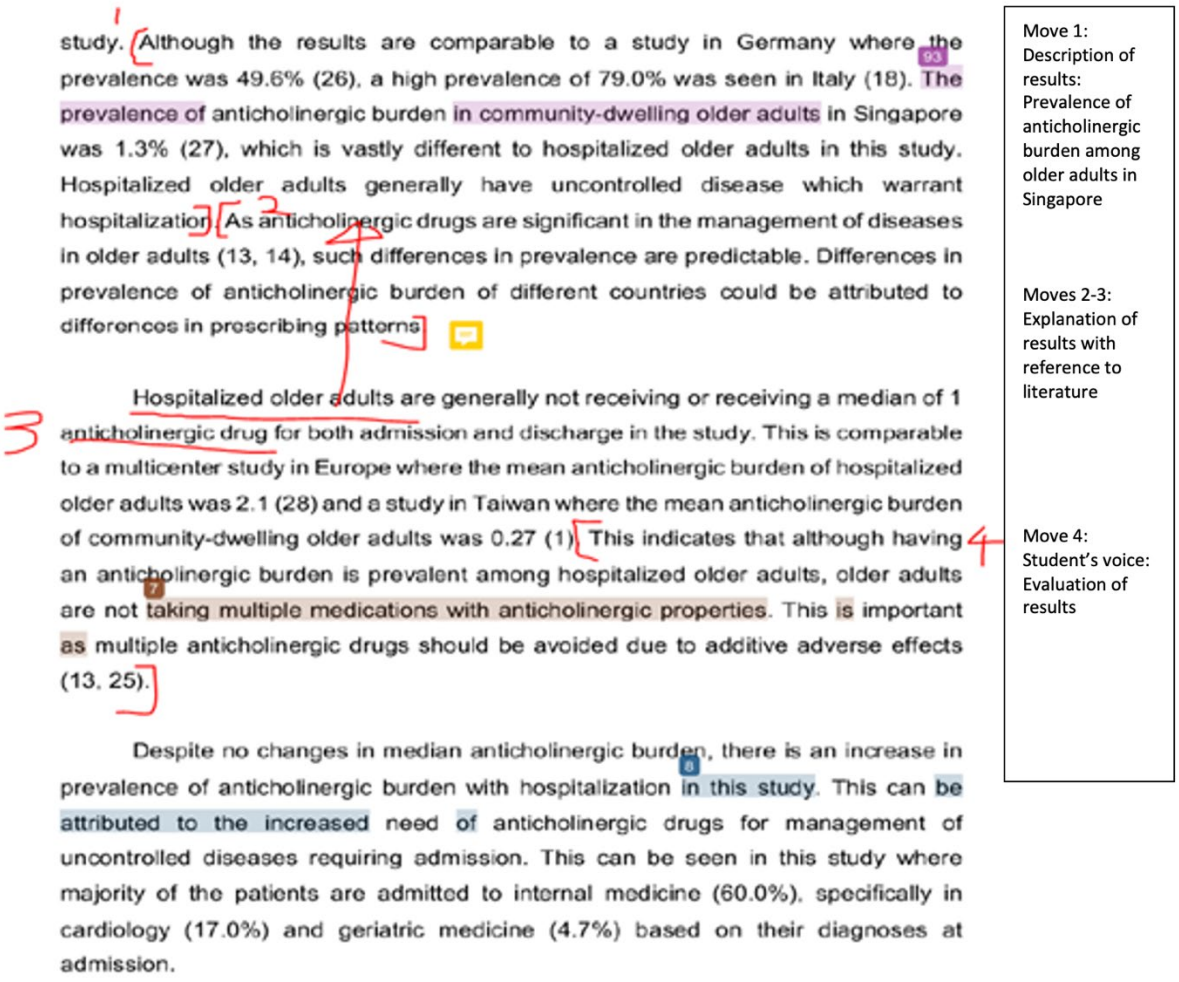


Figure 6. Student's FYP Report Final Draft.

To have an appreciation of students' perceptions of the value of the academic literacy instructors' feedback, in Academic Year 2019/20, as reflected in the university's formal feedback system, the average rating for all four instructors for student feedback with regard to timely and useful feedback is high at 4.8 out of 5. Qualitative comments by the students support the quantitative ratings (Lee & Wu, 2023).

CONCLUSION

The shift towards embedding is a major departure from conventional curriculum design and teaching of academic literacy in isolation from disciplinary content. The collaborative effort of both departments has facilitated a strong interconnectedness between the design of materials and assessment rubrics with individualised feedback. Specifically, this collaboration allows pharmacy experts to focus on developing students' disciplinary research competency while academic literacy instructors help students communicate their research effectively, optimising student-centredness in learning.

While the module has now reached a point of providing a very relevant learning experience for the students, the team intends to further re-examine the degree of disciplinary specificity in materials for the four pharmacy domains. The team also aims to continue customising the materials to address different levels of learner ability, further supporting the weaker and challenging the better.

On lessons learned from this collaboration, we offer three. First, right from the beginning, active collaboration must be anticipated to co-conceptualise and co-design the embedded and integrated curriculum, co-develop the teaching materials and tasks, and co-assess assignments. Second, regular conversations are to be expected for multiple re-calibrations so as to reach a harmonised state. This involves not only the coordinators but the entire faculty that support the students. Third, students who are the main stakeholder must be sensitised to this approach. This is particularly crucial when they receive conflicting comments from their domain and academic literacy instructors so that they can anticipate different perspectives shared by instructors from two different disciplines. In other words, they make sense through clarifying, asking questions, and confirming their own understanding.

In closing, this Reflection—co-authored by domain and academic literacy instructors—offers a glimpse of how interdisciplinary collaboration can be successfully implemented in the context of a year four final year project module.

ABOUT THE CORRESPONDING AUTHOR

Assoc Prof LEE Kooi Cheng (KC Lee) holds concurrent appointments as Director of the Centre for English Language Communication (CELC), and Master-Designate of Helix House, National University of Singapore (NUS).

Kooi Cheng can be reached at elcleekc@nus.edu.sg.

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