

Embedding academic literacy: cooperation, collaboration and team teaching in three content courses

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There has been increasing interest in enhancing undergraduates' written communication skills especially in collaborative settings of facilitating these academic language skills within the context of academic knowledge development (Arkoudis, Baik & Richardson, 2012; Ganobcsik-Williams, 2006; Murray & Nallaya, 2014; Percy, 2014; Wingate, 2012). The notion of embedding best describes these collaborative efforts between subject and English language specialists based on the belief that learning to understand and write articulately about a subject is inseparable from acquiring subject knowledge itself (Spiller & Fraser, 1999). In fact, Hyland (2000) argues that academic reading and writing practices are not general skills but core skills entrenched within disciplinary practices. This paper traces three stages (Blake & Plates, 2010) in the subject and language specialist partnership in three content modules: cooperation, collaboration and team teaching in two engineering and one science course. It investigates challenges in the re-integration of the fields of academic language learning and academic development (Percy, 2014) to examine conditions facilitating or hampering learning. Students' perception of its usefulness is analysed to further shape the courses. Using a combination of computational linguistic tools such as Coh-Metrix (Graesser, McNamara & Kulikowich, 2011) and qualitative surveys, the study presents impact indicators which suggest that these initiatives are effective in improving the competency of and confidence in students' academic literacy skills, especially in the organization of information in assigned tasks. Coh-Metrix analysis shows improvement indicators in the areas of content and organisation, especially in how relevant content knowledge is woven logically together.

Keywords: academic literacy, embedding, impact

Introduction

It is not uncommon for undergraduates to enter university with less than adequate English language proficiency to meet the rigorous academic writing demands of a tertiary education. As a general point of reference, Bok comments on this inadequacy in the context of a university where students are largely native speakers of the language:

Almost everyone agrees on the need to communicate effectively. Curriculum committees regularly affirm the importance of expressing oneself with clarity, precision and if possible, style and grace. So do business executives, law partners and other employers. In Richard Light's lengthy interviews with 1,600

undergraduates, respondents mentioned improving their writing three times as often as any other educational goal (Bok, 2006, p. 85).

In English medium universities, it is commonplace to find students whose first language is not English. As such, Murray and Nallaya (2014) describe a situation where the possible demography of university students is such that

...a proportion have neither the language proficiency necessary to successfully negotiate the demands of their study programmes nor sufficient conversancy in the literacies required to experience successful learning (p. 1).

Besides the need for general proficiency, it is also well established that academic writing competencies needed at tertiary level institutes have to be developed by both native and non-native English language users; the usual practice of focusing solely on students from non-English medium education systems may not be adequate in terms of the support needed. Each new student needs to learn the specific academic discourse conventions that facilitate their participation in their relevant academic communities. Students' ability to manage disciplinary discourses gives them the confidence and predisposes them to further engage critically with content ideas (Wingate, 2012). This critical perspective is an outcome that many undergraduate programmes hope to instil in students.

Various approaches have been developed to facilitate academic writing competencies and they may be broadly aligned to rationales underlying the deficit model, the socialisation process model or the notion of developing students' academic literacies (Ivanic & Lea, 2006). Essentially, the notion of developing students' academic literacies differs from the other two approaches in that it prioritises the meaning-making and identity formation issues in writing within disciplinary communities that are platforms where knowledge is debated and contested. Writing is not seen as a set of decontextualised skills that students lack (deficit model) or a set of norms that students acculturate themselves into (socialisation process model). Inherent in this difference is the issue of the need to learn writing within disciplinary settings that provide the context for student exploration and negotiation of codes, conventions and linguistic behaviour as they learn to be members of the academy.

Adopting the academic literacies perspective (or its variants) to writing would entail the need for discipline embedded writing programmes. The embedding of academic literacy skills learning within content courses aligns well with the general agreement that such writing skills are best taught within the disciplines (Wingate, 2012). Ganobcsik-Williams (2006) outlines effort in various UK universities to explore the learning of academic written and spoken skills within the context of students' learning of content knowledge. Arkoudis, Baik and Richardson (2012) trace the many initiatives in Australian universities to support English language learning from entry to exit, including the embedded approach in appropriate settings.

Drawing on a model by Dudley-Evans and St. John (1998), Blake and Pates (2010) depict the levels of collaboration in such initiatives where the ultimate goal is to have the subject specialist lead the facilitation of students' development of effective communication skills. The stages of cooperation between subject specialist and learning developer (language developer) is as such, with the bold agent taking the lead at respective stages.

Cooperation: **learning developer** + subject specialist

Collaboration: **subject specialist** + learning developer

Team teaching: **learning developer** + **subject specialist**

Handover and consultancy: **subject specialist** + learning developer

At the National University of Singapore, the undergraduate profile consists of both users who learn English as a first language and international students who typically learn English as a second or foreign language. The current approaches to language support programmes centre around both the Socialisation model (where identified academic competencies are taught by language specialists apart from students' content classes) and the Academic Literacies model (where there are varying levels of collaborative effort to develop academic literacy skills in the context of content classes). The approaches adopted here tend to identify closely with the levels of collaboration and team teaching except that given the roles of language developer and subject specialists in this university, the final stage of subject specialists playing a lead role in academic literacy development is not targeted.

Efforts to embed literacy skills in the disciplines is prevalent although research into the impact of such initiatives is less common. Greenhoot and Bernstein (2011) study how students' critical thinking and writing skills are affected in a large class setting where these skills are embedded into the psychology curriculum at Kansas University. The impact of the collaborative effort is investigated through instructor grading of students' work and supplemented by the use of the VALUE rubric which was developed by the Association of American Colleges and Universities (AAC&U) to compare the written communication and critical thinking skills in team-designed and traditional psychology courses. Essentially, the results show statistically significant higher writing and thinking scores for students in the team-designed courses.

Wingate (2012) reports on three initiatives that draw upon academic literacies perspectives to teach writing: disciplines-specific on-line writing support, embedded writing support and genre-based writing instruction. As these initiatives were still at the preliminary stages, Wingate provides mainly student survey and interview data to evaluate the initiatives. Amongst the three initiatives, the genre-based writing instruction is found to be most useful to students as they learn the discourse of discipline journal articles through student written texts, as language developers and the subject specialists cooperate in the identification of suitable texts for instruction.

Murray and Nallaya (2014) provide a case study of the embedding of academic literacies in the curricula of a South Australian university with a diverse student population. The study provides insights into collaboration, resources and challenges related to the initiative, as the impact on academic literacy skills is not its main focus.

In the current study, there are different degrees of embedding of communication elements and collaboration between the subject specialist and the language developer in each of the three modules, namely two engineering modules and one science communication module. The aim of the study is not to compare the impact of embedding across the modules but to investigate the impact of each type of embedding effort on written and spoken communication skills and students' perception of the relative effectiveness. The degree of embedding in the science

module is at the cooperation/collaboration stage while in the engineering modules, team teaching was adopted (Blake & Pates, 2010).

The questions guiding the investigation are as follows.

- To what extent do writing skills of students (as evaluated by relevant raters) develop over a 12 week embedded academic literacy programme?
- What are some of these linguistic features that indicate writing development (as identified by Coh-Metrix)?
- How do respective students view the usefulness of these embedded academic literacy programme?

Methodology

Data were collected from two engineering modules, namely Engineering 1 and Engineering 2 (see Table 1 for background information) and a science communication module. Engineering 1 provides an introductory overview of the major sub-fields of Electrical Engineering, including power and energy systems, micro and nano devices, communications and networking, control, intelligent systems and robotics, and biomedical engineering. This module aims at facilitating students' use of these knowledge areas in combination to solve challenging problems. Assignments are inclined toward developing students' ability to identify and solve complex problems, to retrieve and identify relevant and reliable information and to form coherent and persuasive arguments, effective oral and written communications, while working with three other team members. The embedded communication component takes the form of six team taught tutorial sessions covering topics such as presenting a problem solution proposal, writing the Grand Challenge essay and effective oral presentations. Students are also scheduled on half hour consultation sessions where tutors conference with them on their Grand Challenge drafts. There is also a final oral presentation session where there is an evaluation of students' oral skills.

Engineering 2 focuses on the conceptualisation, design and development of technology oriented new products which ultimately serve as a prototype in a subsequent module. Students experience an integrated learning of innovation and enterprise pertaining to new product development where technology plays a central role. In this module, language and communication account for 50% of the module grade. Communication is embedded in the module through three lectures (1.5 hours each) on fundamentals of communication, persuasive oral proposal and report writing (including the writing of brochures and storyboards) co-taught between the language and subject specialists. There are also three joint oral presentation assessment sessions (3.5 hours each).

The Science Communication 48-hour module was jointly conceptualised and designed by the Language Centre and the Faculty of Science with the aim of developing science undergraduates' communication skills so that they are able to read critically and comprehend science-related publications and to articulate scientific arguments and perspectives coherently, both in writing and orally. Materials are based on five popular science books selected by the Science faculty with the intention for different disciplines to be represented in the selection. These include physics, mathematics, statistics, chemistry and life sciences. Activities woven around these books include reading, classroom discussion, summary

writing, essay writing, and oral presentations. Major assessment tasks include the writing of an argumentative essay and an oral presentation on a related topic of interest. The data was collected from pre- and post-course essays (800 words) written by a cohort of 300 students. The task requirements were aligned closely to specifications that students had to write within their module and were required to demonstrate source based argumentation on a topic of relevance.

Table 1: Background information: Engineering 1, Engineering 2 and Science Communication

Module information	Assessment task	Test methodology
Engineering 1 166 first year students	First and final drafts of grand challenge essays (1500 words). Students play the role of a non-governmental organization convincing the government agency of their proposed solution to a pertinent issue using emerging technologies Task instructions: <ul style="list-style-type: none"> • Propose and define a Grand Challenge • Present data to argue why it is a Grand Challenge • Identify possible solutions to the Grand Challenge • Describe technologies (current and future) that contribute to the solution 	<ul style="list-style-type: none"> • Friedman test, non-parametric test applied on first and last drafts of Grand Challenge essays • <u>Coh metrix</u> analysis
Engineering 2 109 second/ third year students	Product development report	Survey of student perception of a) product development report task b) the embedded language and communication element
Science Communication 300 first year students	Pre and post course argumentative essays Task instructions: Read Texts A-C carefully and write an essay of about 600-700 words to answer the question: <i>Do you support the use of aquaculture as a sustainable method to meet the global demand for food? State your position clearly and use the information from the three texts to support your answer.</i>	Test of significant difference on ratings of 300 pre and post essays

Aryadoust (2014) points out the need to understand writing development and the effectiveness of academic literacy skills courses to inform pedagogical approaches and assessment practices. However, logistical constraints including the data collection process, rating procedures and the subsequent analysis and interpretations hinder the investigative process. There is a need to understand how writing develops in the context of adopted approaches to support the development of these literacy skills at the higher education level.

To trace writing development, one line of approach that uses automated technology to identify descriptive linguistic features involves the use of Coh-Metrix (McNamara, Graesser, McCarthy, & Cai, 2014) which is a tool developed to report on a range of linguistic features that relate to analyses of writing in terms of lexical sophistication, syntactic complexity, and text cohesion. Coh-Metrix is a computational tool that produces indices of the linguistic and discourse representations of a text. These values can be used in many different ways to investigate the cohesion of the explicit text and the coherence of the mental representation of the text. Coh-Metrix has been used in two main lines of investigation: firstly, to understand

human rater variance of written essays and the extent to which this variance can be predicted and explained by categories of linguistic features which raters may look for. Secondly, Coh-Matrix is also used to differentiate linguistic features of high and low scoring essays. In this study Coh-Matrix is used to identify differences in linguistic features in essays that represent the first and final drafts, respectively, of Engineering 1 essays. This analysis provides linguistic details to explain any significant difference found in the two sets of essays scored by the raters. It is expected that essay final drafts should show linguistic features that developed after the period of instruction, albeit within a short space of 12 weeks.

Besides investigation into students' writing, students' perceptions are also gathered through various means. In the engineering modules, students' perceptions were collected through reflective pieces written by individual students as well as questionnaires administered at the end of the embedded programme. In Engineering 2, the questionnaire administered sought students' responses to the lectures, and to the effectiveness of the team-based assessment tasks. Students' insights papers also show their reflections on the course and its related contents.

Results

Engineering 1

Table 2 presents the results of the Friedman test that ascertains possible significant differences between the first and final drafts of students' Grand Challenge essays in terms of Content, Organisation, Language and Total scores.

Table 2 Engineering 1 first and final draft score

	Mean Rank	Significance
Pre Content	1.16	0.003
Post Content	1.84	
Pre Organisation	1.24	0.012
Post Organisation	1.76	
Pre Language	1.45	0.617
Post Language	1.55	
Pre Total	1.66	0.157
Post Total	1.34	

The Mean Rank column shows that scores in all three categories of Content, Organisation and Language and the total scores have improved, with the biggest improvement in the Content category. The categories of Content, Organisation and the total scores also show significantly different results between first and final draft measurements at $p < 0.05$.

Besides the Friedman test, correlations between Coh-Matrix indices and final draft scores were investigated (Table 3). In Table 3, six Coh-Matrix indices were found to be correlated to the respective Content, Organisation, Language and Total scores. Table 4 provides descriptions of the selected indices. Amongst the indices listed, those which relate to strengthening coherence and connectedness in text are evident – namely, the increased incidence of all connectives (CNCAI) in the final drafts, especially with the Language and Total scores. Two indices in the referential cohesion category (CRFNO1 and CRFNOa) also

help develop better cohesion in final drafts as these indices were well correlated with better Content and Organisation scores.

Table 3 Engineering 1 Coh-Metrix indices

	Final draft Content	Final draft Organisation	Final draft Language	Final draft Total
PCDCp Text Easability				.537*
CRFNO1 Noun overlap adjacent sentences binary mean	.471*			
CRFNOa Noun overlap all sentences binary mean		.468*		
CNCA11 Connectives incidence			.471*	.578*
DRNEGN Negation density incidence				.510*
WRDPRP3s Third person singular pronoun incidence			-.653**	-.496**

Table 4 Description of selected Coh-Metrix indices

Coh-Metric Indices	Description
All connectives: CNCA11	This is the incidence of all connectives
Noun overlap: CRFNO1	Adjacent noun overlap (CRFNO1) represents the average number of sentences in the text that have noun overlap from one sentence back to the previous sentence. Among the co-reference measures, it is the most strict, in the sense that the noun must match exactly, in form and plurality.
Noun overlap: CRFNOa	Whereas local overlap considers only adjacent sentences, global overlap (CRFNOa) considers the overlap of each sentence with every other sentence.
Negations: DRNEGN	This is the incidence score for negation expressions
Deep Cohesion: PCDCp	This dimension reflects the degree to which the text contains causal and intentional connectives when there are causal and logical relationships within the text. These connectives help the reader to form a more coherent and deeper understanding of the causal events, processes, and actions in the text. When a text contains many relationships but does not contain those connectives, then the reader must infer the relationships between the ideas in the text. If the text is high in deep cohesion, then those relationships and global cohesion are more explicit.
Third person pronouns: WRDPRP3s	This is the incidence score of pronouns, third person, single form.

Engineering 2

Tables 5 and 6 show student responses indicating their evaluation of lecture content and students' evaluation of how the team assessment of oral presentations facilitate their oral skills development.

Table 5 Students' perception of Engineering 2 lectures

	Strongly Disagree	Disagree	Agree	Strongly agree
Materials covered was adequate.	1	7	109	15
Handouts provided and uploaded to IVLE were adequate.	---	9	107	16
The lectures helped me to understand the assignments better.	---	12	96	24
The lectures helped me to understand writing and oral presentations better.	1	8	104	19
Overall the lectures were relevant and useful.	---	7	102	23

Table 6 Students' perception of Engineering 2 team assessment

	Strongly Disagree	Disagree	Agree	Strongly agree
Being evaluated on language and communication in an Engineering module makes me aware of their importance in an engineer's work.	3	2	98	29
Being evaluated on language and communication gives this module a workplace emphasis.	3	3	99	27
Being evaluated on language and communication makes me focus on these aspects when I present and write.	3	4	103	22

Generally, students perceive the different aspects of the lectures very positively, with all the items registering a score of above 90% when the Agree and Strongly Agree categories were collated. The qualitative comments provide more insights into how students found each of the aspects evaluated helpful. For the lectures, adjectives used to describe the lecture content include the following: useful, interesting, inspiring, enjoyable, good, helpful, well-paced, fun, insightful and eye-opening. In terms of how they were helped, students provided these descriptions.

- concept taught fundamental for working society
- helped me with my report writing
- gives me more in depth idea of marketing and business
- they gave me clear idea for report and ppt
- learn how to write a proper report
- know more about business
- allowed me to gain insight on product development
- provide students with skills for post-university life
- helps me to understand innovations
- right balance in terms of material to get us started

- learn new skills such as designing product brochure and storyboard
- develops an individual in an all rounded manner and prepares him for the working world, including doing reports and presentations
- has definitely given a better idea of what should be included for the reports

Students also found the team assessment of their oral presentations helpful and emphasise their heightened awareness that the communication of content knowledge is as important as a good grasp of that knowledge. The comments below show the students' awareness, as expressed in the survey.

- It is good that some courses emphasis these aspects since they are an important part of engineering work.
- Makes me realize that a good presentation plays a critical role to draw attention and get our ideas passed down.
- This evaluation of communication and language component helps me improve on presentation skills and gives me more confidence on presentation.
- I feel this language and communications aspect really helps us refine our ideas and project them in the most clear manner.
- I like that the focus is spread equally over content and writing skills instead of all on content.
- Engineers need to know how to sell their ideas, else it will be pointless to have a good idea but not know how to sell them. Those aspects of the module helped me realize this.

In selected Insights papers that students wrote as they reflected on the embedded course, students explained the assessment of both the product they had conceptualised and the way their conceptualisation was communicated provided good opportunities to develop their communication skills in a contextualised manner. As one student commented:

The weekly class participation provided me with countless opportunities to express myself as we are assured that no form of participation would be condemned. Furthermore, the communication lectures equipped me with the technicalities of effective presentation and subsequently the various presentation opportunities allowed me put theory into practice and further sharpened my ability to express myself. The enhanced ability to express myself is transformational for me. I used to suffer from stage fright which cripples my learning as I would refrain from asking questions or publicly expressing my views. The increased ability and confidence to express myself would further aid me in my future learning as I seek to participate more actively in classes.

What was helpful to the students was the number of opportunities created over three presentation slots, where students were given feedback to continually improve their oral skills and the quality of content ideas by both the subject specialist and the language developer.

I have been given multiple opportunities to speak throughout this course, both to team members, as well as to a general audience. Furthermore, in between presentations, there was a well-planned seminar on presentation and communication skills. This greatly improved my ability to speak as it provided

much needed corrections (in posture, and speech volume for example) after I found out that I needed help after a particular presentation. I was thus able to make corrections to my next presentation and saw immediate improvements, thus helping me remember better.

Science Communication module

Table 7 presents the results for the T-test conducted on the ratings of 600 pre and post- course essays.

Table 7 T-test results for pre and post course essays

	Average Difference	Significance
Content	0.75	0.001394759
Organisation	1.30	1.39693E-05
Language	0.66	0.001793083
Total	2.71	0.000104426

The post course essays show differences in the average mean score in all categories of Content, Language, Organisation and Total scores. Organisation shows the biggest difference between the pre and post essay grades. The differences are also statistically significant at $p < 0.05$.

Discussion and conclusion

The three contexts of embedding (Engineering 1, Engineering 2 and Science Communication) present somewhat different degrees of collaboration between subject specialists and language developers. However, all three initiatives seem to have had a positive impact on students' written and communication skills, as outlined by the various indicators presented in the prior sections.

In studying the concept of skills transfer where skills learnt in one context are applied to tasks required in a new context, Slomp (2012) argues that when evaluating the impact of writing programmes, the non-linear, non-static and complex nature of skills transfer render the use of such indicators of development questionable. Though fully cognizant of the limitations of what such measurement indicators may mean, it is useful to examine the numerical improvements alongside with students' writing, task rubrics and course learning outcomes to provide a contextualised understanding of what may have been enhanced in the process of learning academic literacy skills in embedded programmes. A closer examination of these impact indicators will also raise related issues and challenges that are inherent in collaborative initiatives such as these, where the interdisciplinary synergy brings along both benefits and difficulties especially in implementation details.

The first and final draft ratings of the Engineering Grand Challenge essays indicated improvements that are statistically significant, especially in the Organisation and Content components. The Language component did not register a statistically significant change in mean scores, which is somewhat not surprising as within an embedded situation of fewer than 20 hours of instruction and practice, it may not be realistic to expect language use to change significantly. Organisation registered an increased mean score and this improvement is further

supported by selected Coh-Metrix indices (Table 3) which identified these four indices to be well correlated with the final draft scores: PCDCp, CRFNO1, CRFNOa and CNCAI. As described in Table 4, these indices reflect the use of various linguistic features such as connectives and noun overlaps in both the sentence and more global levels to enhance the cohesion and coherence of the text. In Crossley & McNamara's (2010) study into cohesion and coherence in student texts, it shows that highly rated texts show fewer cohesive devices being used, as the overuse of such devices interrupts the reader's sense of connections in background knowledge used to interpret these texts. However, the indices that show improvement in this study reflect the fluency of ideas at the coherence level rather than just the cohesive device level. In particular, PCDCp reflects deep cohesion that transcends the use of correct cohesive items in a manner where the logical and causal flow of ideas between textual events, processes and actions is coherently articulated.

A qualitative examination of selected segments of an essay may demonstrate the improvement in the coherence aspects of the student's text (discussion is beyond the scope of this paper), especially in the signposting of ideas that provide pointers on how certain threads of arguments would be developed.

Collaborative effort between the language developer and subject specialist in this initiative was generally beneficial as the joint effort began from the stage of conceptualisation of the initiative right down to the development of task prompts, materials and content used in the lecture. The stage by stage collaboration ensured that there was close alignment between what the subject specialisation perceived as necessary to be learnt amongst students in the module and what was taught by the language developer in the process. The subject specialist's effort in deconstructing the specific expectations for the writing task and especially, the provision of samples of student writing to illustrate areas of communicative lack to the language developer presented lots of good content for the latter's lecture on writing. The main challenge to this collaborative effort is the amount of time that had to be synchronised for discussion and the identification of good student sample writing to illustrate teaching points well. The subject specialist had to consistently look for and provide these samples and bear the added workload in collaborating with the language developer. The other main area of difficulty was the consensus that was needed amongst the group of subject specialists teaching the module; for example, consensus with regard to the proportion of marks given to the assessment of communication aspects of a content module was arrived at only after much debate.

Survey results gathered on Engineering 2 point to generally positive student responses toward the initiative in terms of the usefulness of lecture sessions and the team oral assessments. It would be good to understand the impact of this embedding initiative through a study of whether and how oral skills have improved. One of the most important benefits of this embedded effort is that students hear comments on the effectiveness of their presentation skills in the context of the presentation of content ideas in their disciplinary modules. Students' comments indicate that they become more acutely aware of fact that the ability to communicate content clearly is as important as the quality of content presented as this need for clear communication was conveyed to them in the presence of the subject specialists and the language developers. Specific comments on how the quality of ideas could be compromised were pointed out clearly with the support of subject specialists at the

presentation site and that presence validated the significance of the feedback in many ways. The sanction provided relating to communication aspects by a very important member of the disciplinary community – the subject specialist - is a very important element in making an indelible imprint on the students' awareness. Students often claim that their content lecturers are not concerned with the aesthetics of presentation, as long as the content is rigorous. These claims are effectively countered in these embedded sessions as subject specialists chorus in unison with the language developers on the importance of clear oral communication.

One of the difficulties encountered in this initiative was the apprehension amongst some subject specialists who were not too convinced about the need for the embedded approach. Reasons, cited in Murray and Nallaya,(2014), could well explain the lack of commitment to the initiative; perhaps these subject specialists did not necessarily see that academic literacies are best learnt in the context of the learning of disciplinary knowledge. Additionally, their roles were expanded significantly with this initiative and very importantly, not all subject specialists were comfortable in supporting or expressing comments on communication matters as they see themselves strictly as experts in their respective disciplinary content knowledge only.

The Science Communication module has been effective in improving the grades of students' post-course essays as compared to the pre-course essays. One of the four expressed learning outcomes of the module is to develop the coherence of students' writing and oral communication. The T-test results indicate the greatest improvement in students' Organisation in their post-course essays. Organisation here refers to these aspects that were graded.

- Introduction with position/ thesis stated and a conclusion with the position reinforced
- Functions of source ideas discernible (contrastive, supporting, illustrative, explanation)
- Effective integration of source ideas and author's ideas
- Logical progression of ideas between sentences
- Connecting persuasive thread of ideas within and between paragraphs (convergence with main position evident)

A qualitative analysis of selected essays shows (discussion is beyond the scope of this paper) evidence of students' integration of source ideas and their ideas in a manner that brings out the importance of using the sources to undergird their own ideas. The links between ideas in sentences and across paragraphs were also enhanced with relevant linguistic features, including lexical and grammatical words and phrases.

The study into three embedded initiatives points to possible effective learning of academic literacy skills in contexts where students can see the relevance of these learning outcomes in their disciplinary subjects. Although it is a challenge to trace writing skills development through quantitative measures, this study provides a preliminary foray into the possibility of doing so. Undeniably, a qualitative discourse analysis on selected texts would yield more concrete evidence of how student writing may have improved between the pre and post instruction phases. This would constitute the next phase of the current study.

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