Teaching EAP in Information Technology Engineering from a Disciplinary Literacy Perspective

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ABSTRACT

This paper examines the level of preparedness among students studying an undergraduate programme in an Indian university to handle the academic demands of a specialist course. The participants are a group of 80 students studying engineering in IT in an Indian university and 8 discipline experts teaching in the same university. The data reveals the challenges that the learners face as far as their literacy in IT is concerned and foregrounds the need to teach EAP from a disciplinary literacy perspective.

Key Words: EAP, information technology, engineering, disciplinary literacy, ESL

1. INTRODUCTION

A close examination of the learners' preparation for tertiary or university level studies in an English as a Second Language (ESL) context draws our attention to the teaching of English for Academic Purposes in an ESL context. Out of the four types of EAP situations discussed by Dudley-Evans & St. John (1998) on EAP, the *EAP in ESL* situations closely reflect the EAP situation in India. In such situations learning may be limited to general English and in many cases English may be associated with the study of literary aspects of English (Dudley-Evans & St, John, 1998). Consequently, learners may not be prepared for tertiary level or university level studies where they are required to engage with knowledge in new ways and exercise higher order academic skills. In other words, they will be required to acquire a new literacy that is typical of their chosen field of study (Hyland, 2014). Another major influence in EAP as an approach is disciplinary variation. Academic discourse and meaning making processes differ across disciplines.

The complexity of the situation and the apparent lack of preparedness among learners for university level studies in an ESL situation gave us the premise for this research work. The present study examines the disciplinary literacy challenges of a group of students studying engineering in Information Technology (IT) in an Indian University. A comparative study of the reading strategies used by teachers of information technology in their academic and professional contexts, and those used by the learners of information technology for academic purposes was conducted in order to understand the problems associated with disciplinary literacy in IT among the learners, and if limited proficiency in EAP could be a reason by first identifying their problems and then by making a comparative study of how teachers and students perceive reading and writing in IT.

According to Shanahan & Shanahan (2012), studies on disciplinary literacy are "drawn from expert-novice comparisons…" where techniques like thinking aloud are used to identify the strategies that experts and novices use in a particular discipline. While the present study explores this research construct too, the fact that

it focuses on information and technology as a distinct discipline serves to set it apart from other studies as it has wider implications for the pedagogical aspect of literacy in this discipline and other related disciplines from the field of technology and engineering.

The study was guided by the following research questions:

a. Are the learners able to effectively comprehend and produce meaningful texts in IT?

b. What are the problem areas in literacy development in IT?

c. What are the pedagogical aspects that could be explored to develop literacy in IT?

2. LITERATURE REVIEW

EAP in an ESL context and disciplinary literacy

Exploring the disciplinary variations while designing an EAP course for an academic group has been one of the key theoretical principles of EAP education. Dudley-Evans and St. John (1998) suggested three levels of cooperation in order to engage with disciplines- cooperation, collaboration and team-teaching that involves the language teacher engaging herself in identifying the needs of the students of a specific discipline, working in close coordination involving designing and running courses, and team-teaching where EAP and subject teachers teach the students collaboratively.

Flowerdew (2012) discusses the opposing views on common core skills and specific skills along with the theoretical underpinnings that have influenced the growth of EAP. While the common core theorists believe that a common set of skills that exist across disciplines form the study of EAP, the proponents of specificity in EAP emphasize on the need for a set of skills based on disciplinary variations. Thus, investigating those variations in terms of practices and discourse will take us closer to discipline specific literacy. Hyland (2014) states that ELT practitioners should seek to identify and describe those linguistic, discourse and communicative features of a discipline that can help learners deal with disciplinary variations more effectively.

Empirical evidence in support of disciplinary variations and the importance of specificity in literacy practices at the tertiary level make the case for EAP education with a disciplinary literacy perspective very strong. Disciplinary literacy is an emerging area of research and positions itself as a different form of approach from the more widely known content area literacy approach (Shanahan & Shanahan, 2012). While content literacy emphasizes the importance of acquiring a set of general academic skills that enable the learner to comprehend the content, disciplinary literacy is about engaging in "social, semiotic, and cognitive practices consistent with those of content experts" (Fang, 2012). As learners move to high school and senior secondary school, their learning becomes more and more specific. Accordingly, their literacy demands become more specific. Thus, the pyramid that moves from general to more specific literacy skills illustrate the "increasing specialization of literary development." (Shanahan & Shanahan, 2008).

Methodology

A standard qualitative methodology was employed to analyze the data collected from the interviews and the survey questions. The study was carried out with 80 engineering students and eight teachers of IT from an Indian university. Four teachers who teach EAP to engineering students were also approached for the study.

3.1. Data Analysis

Data analysis was done in two phases for both the groups. In the first phase, the ten closed questions were quantitatively analyzed in terms of frequency of occurrence. The open-ended survey questions were qualitatively analyzed. In order to do it as systematically as possible, Gao and Zhang's (2020) five-step data analysis procedure were followed. In the first step the data was checked multiple times to separate the relevant responses from the irrelevant and incomplete responses. In the second step the data were examined several times and open codes were generated. In the third step, themes based on the codes were arrived at. For the first group 102 types of sub-themes were generated. The fourth step also known as selective coding in qualitative research led to the generation of six major difficulties pointed out by them in reading and producing IT texts. The fifth step, that is, producing the report, we prepared a detailed report of the data collected and analyzed with illustrative samples.

In the second phase, the data collected through interviews were carefully studied and analyzed in order to attain a deeper level of understanding of the students and the teachers' views and opinions.

4. FINDINGS

4.1 Qualitative Data

The qualitative data collected through interviews and focus group interviews revealed that learners faced issues that were typical of the discipline as well as generic language issues related to academic skills in English.

4.1.1. The students' views

The data is presented with illustrative samples of some responses by the students. The qualitative data mainly concentrated on three aspects:

i. Language Issues

ii. Reading and writing

iii. Quantitative literacy

Language issues:

Specialist terms and expressions are discipline specific and are presented in…. They vary from core IT expressions to expressions that acquire special meanings in a particular context in IT.

Illustrative sample:

For example,

What does a semantic analysis do while designing a compiler?

In order to understand the work flow of the semantic phase of a compiler, we should first be able to understand what 'semantics' means in that particular context.

Reading and writing:

Students are required to produce longer texts like project reports where a specific discourse and style of writing is expected to be followed. However, the students seemed to lack confidence in producing texts that represent descriptions or planning solutions based on real-world IT related activities.

Illustrative sample: *I'm confused about how to write. I usually include all the factual information but somehow do not score as expected.*

Analysis of the data further revealed that the learners found IT texts very abstract and

conceptually dense. Learners seemed to lack the required proficiency in negotiating texts that presented knowledge in the form of abstract concepts and lacked adequate context support.

Illustrative sample 1: *Online videos are far more interesting as texts are content-heavy and dull.*

Illustrative sample 2: *The concepts in IT are conceptual. It is difficult to understand how an operating system handles all management works like CPU scheduling, Inter Process communications, resolving a deadlock situation etc. We need support in terms of videos and demonstrations.*

Quantitative literacy:

Quantitative literacy is the core of IT literacy. Codes, equations, derivations, etc. characterize the workings of 'problems and solutions' in IT. However, learners mentioned that quantitative literacy demands practice and may take time to acquire.

Illustrative samples: *Equations, codes, derivations, etc. are integral to IT literacy. Therefore, it is important for us to be able to express everything through mathematical expression. However, acquiring quantitative literacy and solving a technical problem through equations and codes require practice.*

4.1.2. The teachers' views

In order to understand the problems that the teachers noticed in the written discourse of the learners and their expectations of the kind of knowledge they expected their learners to have, the data collected from the semi-structured interviews and the survey questions were qualitatively analyzed.

Some patterns that emerged from the analysis of the data are:

- Higher order literacy skills: Learners lack the ability to produce texts meaningfully which demand higher cognitive skills like describing, differentiating, and analyzing.
- The texts become incomprehensible as learners are unable to express their thoughts in a discourse that aligns with the disciplinary conventions.
- Majority of the writing is plagiarized which could be because of lack of proper practice in writing.
- Grammatical correctness or the lack of it is often overlooked and teachers usually focus more on the content. However, it can make their writing completely incomprehensible at times.

4.2. Findings from the Quantitative Data

Working with the assumption that there would be considerable differences in the way teachers and students approached IT texts, we presented the same set of closed questions to both the groups. Some of the key findings based on the quantitative data have been discussed here.

Table 1 shows their views on the questions asked to the students and the teachers considering students and teachers as entities. Their responses are graded into four categories: *strongly agree, agree, disagree and strongly disagree*. The eight questions asked to both students and teachers sought their views on the following issues:

i. Analysis of quantitative terminology to understand an IT problem.

ii. Analysis of technical terminology to comprehend a text.

iii. Use of dictionary to find meaning

iv. Views on use of background information

v. Use of graphical/pictorial representations

vi. Use of multimedia resources over text books

vii. Relationship between language proficiency and literacy in IT

Their responses have been shown in percentage(response to total entity) in the bar graphs (see Fig. 1-8). Table 1 depicts the whole scenario.

Table 1: Responses to the questions

Sl No.	Views on	Entity	Strongly Agree(%)	Agree(%)	Disagree(%)	Strongly Disagree(%)
1	Quantitative terminology to understand an IT problem	Students	75	20	4	0
		Teachers	85	15	4	0
2	Technical terminology t comprehend a text	Students	20	22	35	25
		Teachers	40	45	10	5
3	Use of dictionary to find meaning	Students	70	20	10	0
		Teachers	35	33	35	0
4	Comprehending abstract concepts	Students	35	30	25	10
		Teachers	75	20	5	0
5	Use of backgroun information	Students	20	35	35	0
		Teachers	45	43	5	0
6	Use of graphical/pictoria representations	Students	33	42	10	7
		Teachers	5	20	45	30
7	Use of multimedia resource over text books	Students	52	40	8	0
		Teachers	15	25	35	15
8	Relationship between Englis language proficiency an literacy in IT	Students	22	20	55	2
		Teachers	22	20	58	0

From table1 it is understood that both students and teachers responded differently to most of the questions. We have drawn some important conclusions from this table that is discussed in the next section.

From figure 1, it can be concluded that analysis of quantitative terminology is an important reading strategy in IT. Majority of them (both the groups) strongly agree with this statement.

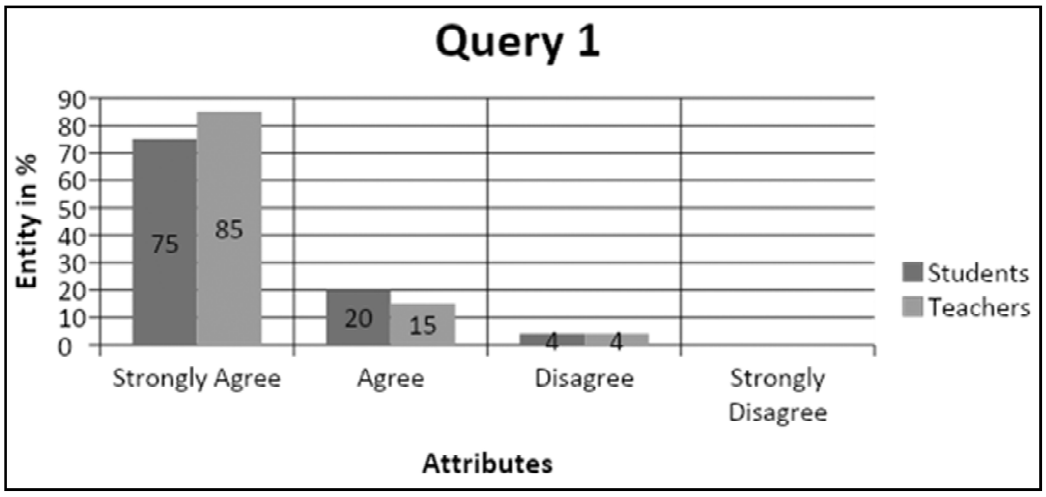

Figure 1. Views on analysis of quantitative terminology to understand an IT problem

Fig. 2 reveals that while the teachers believe that analyzing technical terms is important to comprehend a text, learners do not seem to analyze the meaning of the technical terms or use contextual clues to comprehend a text. As observed from the data in fig 3, learners often use online or offline resources to find the meaning of the word. However, learning to analyze the technical terms can help learners infer the meaning from the text which will eventually make them more independent readers.

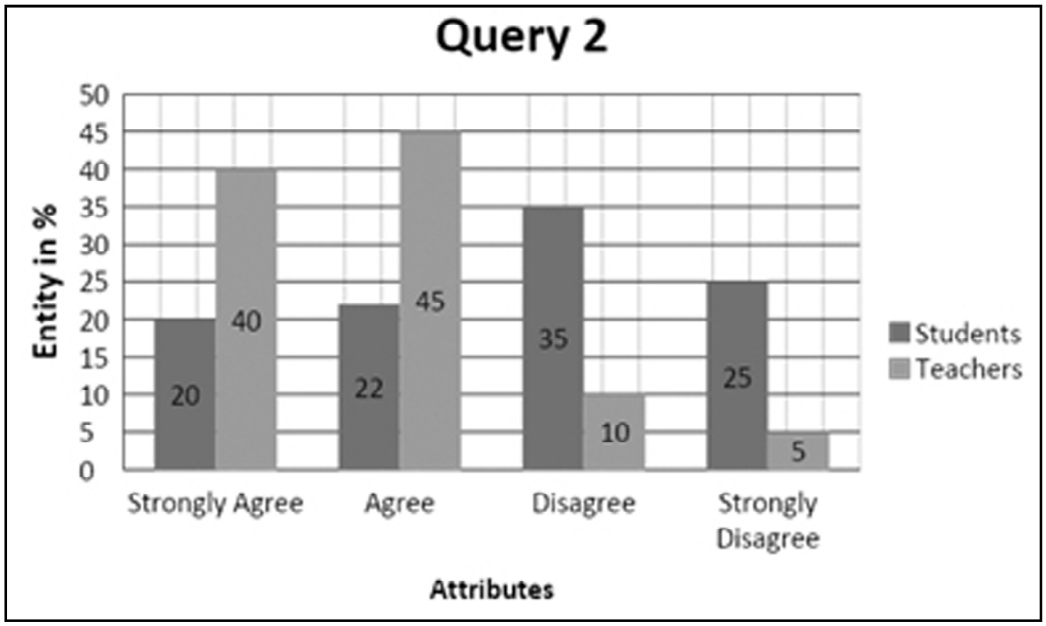

Figure 2. Views on analysis of technical terminology to comprehend a text

Figure 3. Use of dictionary to find meaning

Scientific language especially in IT is abstract. Fig. 4 and 5 indicate a difference in the way learners and teachers approach concepts that are abstract in nature. While students prefer to memorize concepts that are abstract, teachers believe that learners should be able to synthesize information given in the text and use background information to understand a concept.

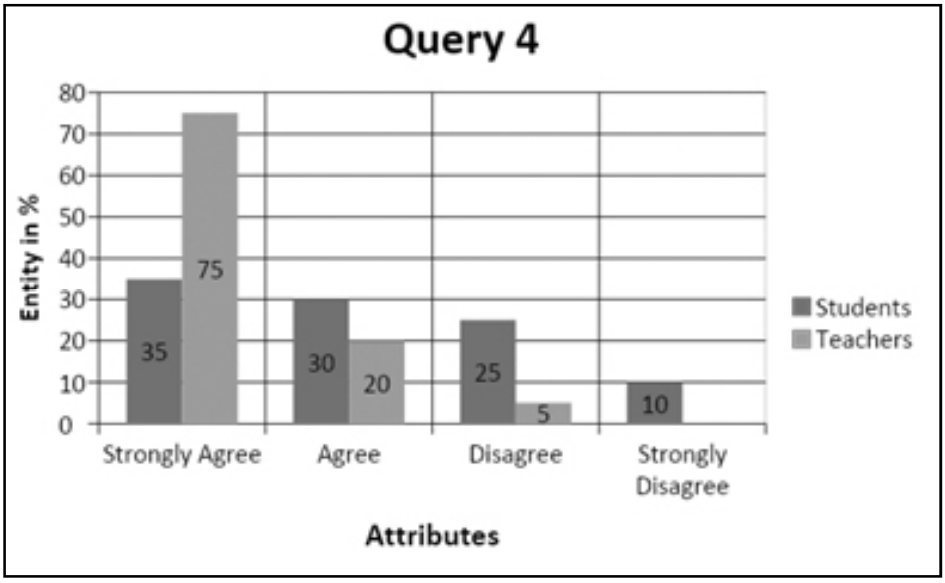

Figure 4. Views on comprehending abstract concepts

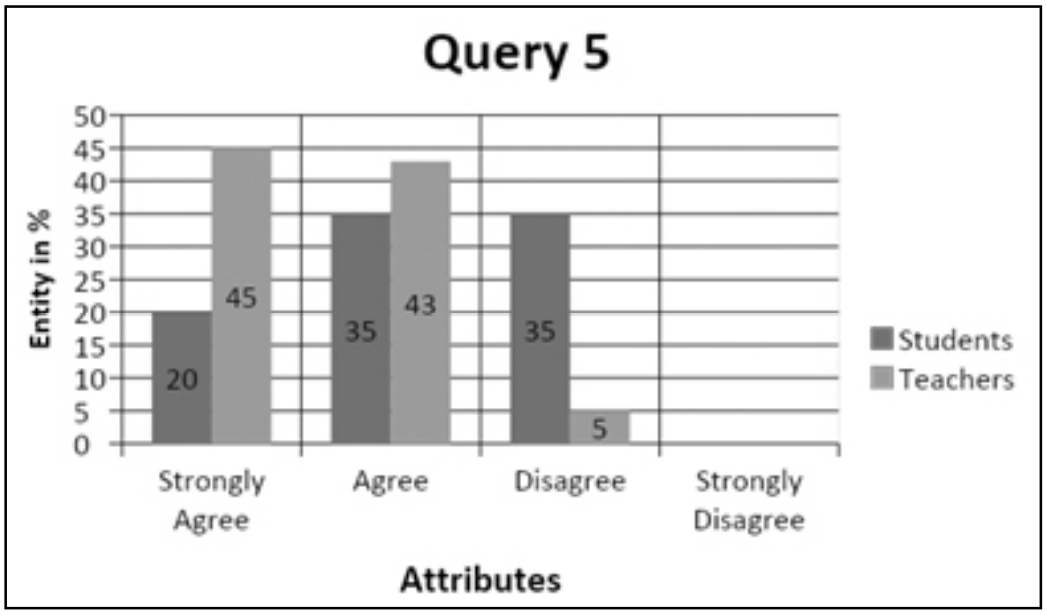

Figure 5. Views on use of background information

It is evident from Fig. 6 and 7 that the teachers believed that both verbal descriptions and graphical/pictorial representations were necessary to comprehend a text. The data collected in the interviews corroborate this view. Moreover, teachers also considered online videos as supplementary resources of study only and not the primary source of study. On the other hand, learners found multimedia tools like videos and graphical representations more useful.

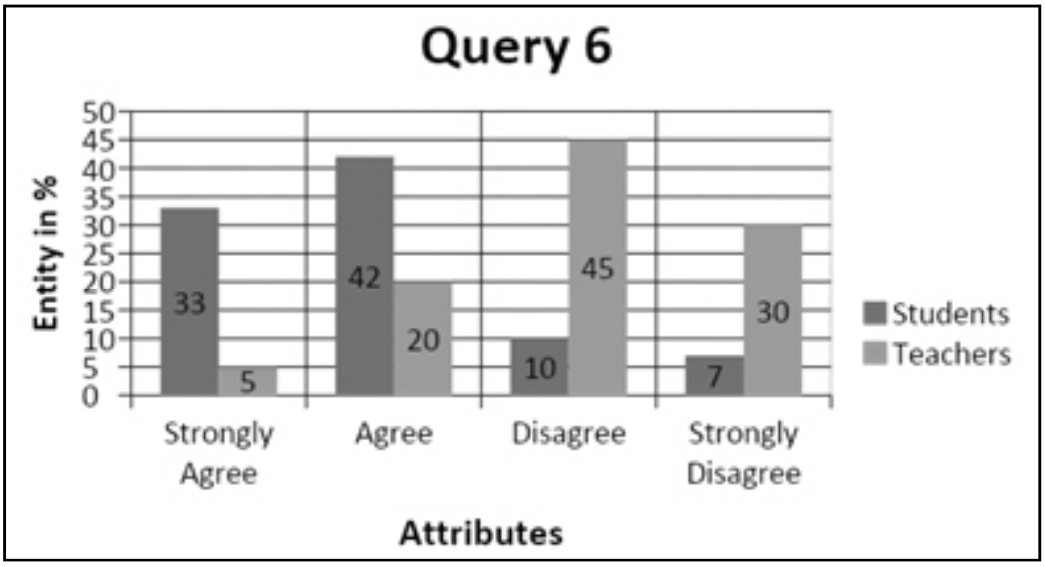

Figure 6. Use of graphical/pictorial representations

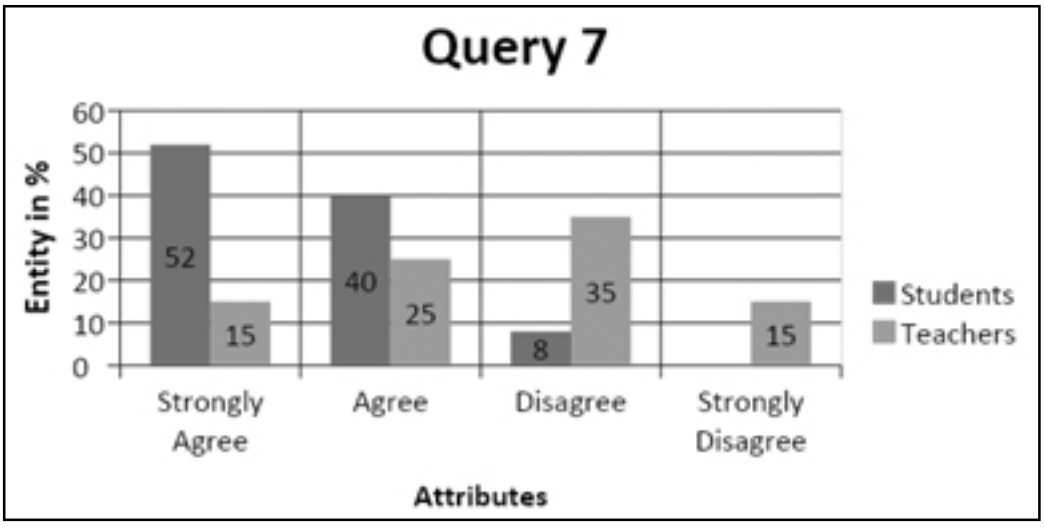

Figure 7. Use of multimedia resources over text books

Fig. 8 shows the responses to the question related to language proficiency and literacy in IT. Both students and teachers believed that language proficiency was not very essential to develop literacy in IT. This question was not directly related to reading strategies but was an important question to collect data on the difficulties learners faced in dealing with IT texts.

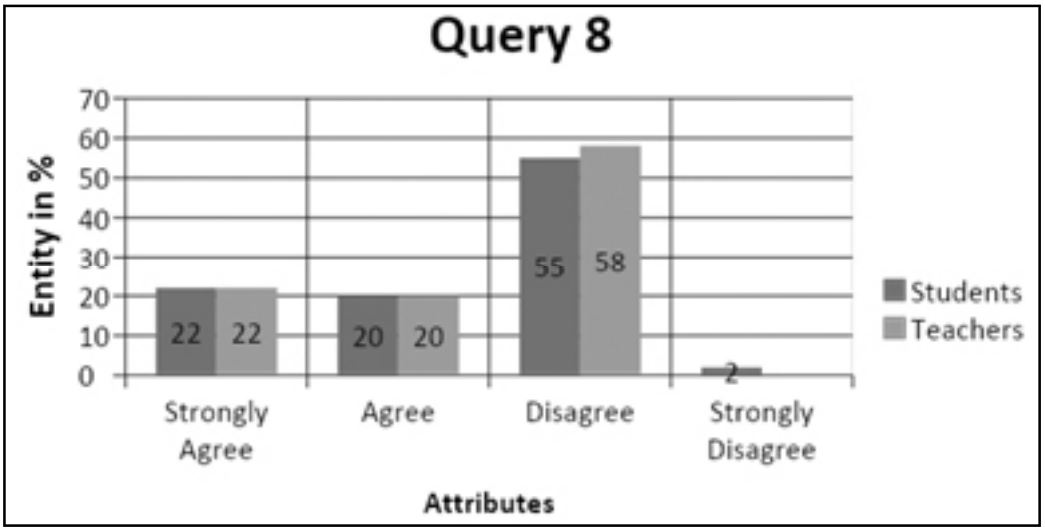

Figure 8. Represents the views on the relationship between language proficiency and literacy in IT

5. DISCUSSION

Some of the key findings that emerged from the qualitative and quantitative data collected from both the sets of participants revealed that content teaching overpowers disciplinary literacy practices. For example, it was found that teachers put a lot of emphasis on vocabulary learning. They said that selecting key words and understanding their meaning is absolutely necessary to comprehend an IT text. However, the teachers did not suggest any ways of understanding vocabulary from the context or with the help of contextual clues. They suggested looking for the meaning in the dictionary or finding it out from online resources. It points towards a content learning goal and not a disciplinary literacy development goal. Reading from a discipline specific perspective allows the reader to understand the text in ways that are more aligned to the culture of that discipline. As Moje (2007) states,

Reading, for example, is more than the simple process of decoding words and assigning meaning; reading involves decoding, to be sure, but also requires knowledge of semantics, syntax, text structures, linguistic features, purposes for reading and rhetorical devices. Reading depends heavily on the content knowledge one brings to a text. (p.9)

Some of the other difficulties pointed out by the learners include difficulty in producing texts for lack of suitable vocabulary and the skill to produce texts that approximates the discipline specific style of discourse presentation. Every discipline has ways of presenting the text in a discourse typical of its own. However, teachers/ tutors may underscore the level of difficulty experienced by students in writing disciplinary texts in English or a second language (Hyland, 2017). As noticed from the data analysis providing writing opportunities in the class through activities that encourage them to engage with the text in more meaningful ways is necessary in order to help learners acquire discourse competency in IT.

Additionally, the functional use of language in understanding a disciplinary text is often overlooked though it forms a core part of disciplinary literacy development. Linguistic analysis or more specifically identifying features that are more explicitly present in IT is fundamental to IT literacy development. While discussing the functional view of language, Fang (2012), mentions that not only the lingo but also the grammar is different across disciplines.

6. CONCLUSION

This research work examined disciplinary literacy challenges of the information technology students and highlighted the importance of teaching EAP from a disciplinary literacy perspective. It further revealed the need for close coordination between EAP and content teachers to accomplish the larger goal of developing learners' academic and disciplinary literacy practices.

However, there seems to be a lack of awareness among the content teachers about the importance of such a collaborative approach (Shanahan & Shanahan, 2017). Not all the IT teachers could be a part of this study. Thus, we had 14 teachers who responded to the questionnaire and eight teachers who agreed to the interviews. This study could have been more robust had there been more teacher participants.

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