AC 2011-614: EPISTEMIC BELIEFS AND USE OF COMPREHENSION STRATEGIES BY INDIAN AND U.S. ENGINEERING UNDERGRADUATES

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Abstract

Engineers must actively process information and critically evaluate spoken, written, and electronic sources in their professional work. Data in this study were collected from a random sample of freshman through senior engineering students at an Indian Institute of Technology (IIT) and were compared to existing data from a sample of U.S. engineering students. English is used in all academic instruction at IITs, however, it is not students' native language. Literacy research suggests that individuals are disadvantaged when processing information in a non-native language. This study applied two psychometric scales. One scale measured use of reading strategies; the other measured attitudes about interpreting and critiquing written information. Additional questions concerned school-related academic and reading activities. The findings are discussed in terms of language and cultural differences. Implications for curriculum change are also considered.

One element in the training, credentialing, hiring, and retaining of engineers relates to their language and information skills. Competent engineers must be capable of both processing and communicating information effectively. The need for information-literate engineers is addressed in ABET 2009[1] criteria that include the ability to analyze and interpret data and to engage in engineering practices in global, economic, environmental, and societal contexts. These goals set the agenda for engineering education.[2-4] Information competencies go beyond being able to comprehend or give a simple interpretation of information, and are regarded as intricate and complex. Starkey and colleagues[5] use the term *information fluency* to refer to skills, attitudes, knowledge, and a range of ways of experiencing information use. In the Engineering Science program at Trinity University, for example, engineering students "learn to access, understand, and evaluate information, use it ethically, and create new material (papers, presentations, or other products) based on that information" with an emphasis on critical and creative thinking.[3] The development of information fluency involves incremental growth in proficiency.[5] It requires more than a single visit with the school librarian or a couple of written research assignments. Within a demanding and supportive curriculum, it would be reasonable to expect to observe development in information fluency in engineering students in their freshman to senior years.

Measures of Information Fluency

The processing of information is an intricate interplay between the person and the information source. On the one hand, there are strategies for negotiating the complexities of information. These are termed *metacognitive strategies* because they relate to how a person monitors and guides comprehension of information. On the other hand, individuals hold specific beliefs about the nature and purpose of information. These are termed *epistemic beliefs* because they relate to individuals' beliefs about the nature of knowledge. Metacognitive strategy use and epistemic beliefs are measured in the present research. These measures have been applied previously to processing written materials, and they are used in the present paper.

The Metacognitive Reading Strategy Questionnaire (MRSQ)

Research has shown that effective comprehension and learning depend on directed cognitive effort to regulate and enhance text processing.[6-9] Skilled readers apply multiple strategies in a purposeful manner. These include setting reading goals, varying reading style according to the relevance of the text to reading goals, jumping forward and backward in the text to find information relevant to reading goals, making predictions about what the author will say, paraphrasing, explaining, and interpreting the text, and constructing summaries and conclusions. Skilled readers know multiple strategies and also know when to apply them.[10, 11]

The Metacognitive Reading Strategies Questionnaire (MRSQ) measures students' use of metacognitive comprehension strategies.[12] The MRSQ consists of two subscales. One subscale measures cognitively-based **analytic strategies** related to processes like inference and evaluation (e.g., an item from the analytic subscale: *As I am reading, I evaluate the text to determine whether it contributes to my knowledge and understanding of the subject*). The other subscale measures action-based **pragmatic strategies** that a student applies in order to remember or later find information (e.g., an item from the pragmatic subscale: *I make notes when reading in order to remember the information*).

Analytic strategies are more strongly associated with cognitive analysis of information and pragmatic strategies with highlighting and retaining information.[12-14] The items that make up the MRSQ are listed in the Appendix.

The Reader Belief Inventory (RBI)

Readers process written materials with beliefs about their role in the reading process and with expectations about what the material should communicate.[15-18] Readers' beliefs affect their interpretation and response to the text.[15-18] Wineburg[19], for instance, showed that professional historians read history texts from a more critical perspective than high-school students. The historians actively questioned and interpreted the text. Their response was not due simply to greater knowledge, but to their beliefs about how one should respond to and interact with information.

The Reader Belief Inventory (RBI) measures students' beliefs about text.[17] The RBI consists of two subscales, reflecting *transmission* and *transaction* beliefs. **Transmission beliefs** treat text as a means of direct communication between author and reader, without interpretation (e.g., an item from the transmission subscale: *The main purpose of reading is to understand what the author says*). If a reader holds this view, he expects the author to communicate factual information in a direct fashion. The author is the authority. From a transmission perspective, reading is a one-way, linear process: the author presents it and the reader receives it. From a transaction perspective, on the other hand, reading is a dynamic process. **Transaction beliefs** emphasize the construction of knowledge by individuals (e.g., an item from the transaction subscale: *I enjoy interpreting what I read in a personal way*).[16, 17] When readers adopt a transaction model, they develop a dynamic response to the author, and take an active role in the construction of meaning, drawing on personal experiences, and critiquing the author's message.

According to transaction beliefs, text means different things to different people, and allows for a number of possible interpretations. A person mentally interacts with and responds to the author. The items that make up the RBI are listed in the Appendix.

Importantly, the MRSQ and RBI are applicable to expository texts. Expository texts include non-fiction like textbooks, journals, reference books, and instruction manuals, that is, the kinds of texts encountered in an engineering curriculum. Metacognitive strategies assist in constructing and using a coherent representation of information, including expository information, as evidenced, for example, in their applications in reading physics.[6] Similarly, Dai and Wang[15] showed that the RBI is predictive of comprehension of expository text.

Epistemology and Culture

A person's view of the nature or knowledge and his or her beliefs about knowledge (epistemic beliefs) relate to cognitive processing, learning, and intellectual development. The role of epistemic beliefs in academic settings has been a topic of research for decades in the U.S. This has given the models a Western orientation and has the potential to filter a person's perceptions through a particular ethnocentric lens. More recently, a greater sensitivity and interest in other cultures has evolved[20], a development that is both relevant and necessary in a workplace where many cultures increasingly converge when confronting issues of common interest. The motivation for the present study was to provide a non-Western data point regarding engineering undergraduates' perspectives on literacy, metacognitive processing of information, and epistemic beliefs. The comparison to a U.S. sample provides a piecemeal and incomplete depiction of differences. Nonetheless, there is value in the attempt to explore a uniform rubric for considering cultural differences, with a longer-term goal of delineating more inclusive and culturally-sensitive models of students, their beliefs, how they learn, and how they process information.

Information Processing in a Non-Native Language

Another purpose of this research is to examine how processing information in a non-native language affects information fluency in engineering undergraduates. Vianty[21] explored the difference in students' use of metacognitive reading strategies in their native language, Bahasa Indonesia, and their second language, English. Participants were enrolled in the English Study Program in the Faculty of Teacher Training and Education at Sriwijaya University in Indonesia. The MRSQ[12] was translated into Bahasa. During the first session, participants completed an English reading test and the MRSQ. In the second session, they completed an equivalent Bahasa reading test and the Bahasa version of the MRSQ. The results showed a difference in the type of metacognitive reading strategies employed while reading academic material in each of the two languages. Students reported using analytic strategies significantly more in Bahasa than English. Conversely, use of pragmatic strategies was higher when reading in English. Pragmatic strategies are used to highlight and underline important information in a text to remember it and to make it easier to find later. In that sense pragmatic strategies assist in the basic selection, organization, and encoding of information. Information processing in a second language may be sufficiently challenging to evoke basic and practical steps to comprehend and retain information.

Razi[22] conducted a study of advanced-level English as a foreign language (EFL) undergraduate students in Turkey. His goal was to test the effects of direct instruction on the use of metacognitive reading strategies. He administered the MRSQ at the outset and conclusion of the study. Of interest here, were the pretest scores. Consistent with the data from Vianty[21], Turkish students reading in English reported using pragmatic strategies more frequently than analytic strategies.

Rationale and Hypotheses

The present research is motivated by questions of cross-cultural differences in information processing. The major questions concern how engineering students whose academic language, but not their native language, is English compare to students whose academic and native language is English. These questions are important given that professionals must often work outside of their native language in a global workplace. English is tested here out of convenience. Taraban[23] tested a sample of U.S. engineering majors using the MRSQ and RBI. He found that U.S. students used analytic strategies more frequently than pragmatic strategies, and that students increased their use of strategies as they progressed from freshman to senior years. Those findings are summarized in Figure 1A. U.S. students also applied transaction beliefs to reading more often than transmission beliefs. Quite unexpectedly, though, students showed a monotonic decrease in transaction beliefs and a monotonic increase in transmission beliefs from freshman to senior years, as shown in Figure 2A. This was surprising in the context of models of intellectual development for engineering students.[24] According to these models, freshmen are typically dualists, expecting information to be either true or false, which is consistent with a transmission orientation. By their senior years, students recognize the relativism in knowledge, the possibility of multiple interpretations, the role of evidence, and the use of discourse in establishing consensus, which is consistent with a transaction orientation. This pattern did not hold in the U.S. engineering student data and was attributed to an engineering curriculum that was heavily focused on textbooks and exams. The U.S. curriculum did not afford students clear opportunities to engage in transaction thinking about issues like sustainability, social responsibility, and professional ethics.

The experimental data for this study were collected at an Indian Institute of Technology. Two hypotheses were associated with metacognitive strategies. The first hypothesis was that Indian students would tend to apply pragmatic strategies over analytic strategies when reading for academics, compared to U.S. students, as a compensatory mechanism for reading outside their native language. This prediction is based on the experiments by Vianty[21] and Razi[22] reported above and is based on the premise that Indian students have English as a second language; however, it is possible that Indian students are bilingual and process their native language and English with good facility. It was less clear whether Indian students would apply analytic strategies more frequently than U.S. students. Mean use of analytic strategies in Razi[22] for English and in Vianty[21] for native Bahasa Indonesia were higher than for U.S. students [23]; however, U.S. students were more likely to use analytic strategies compared to students in Vianty[21] reading English.

The second hypothesis relates to growth in strategy use. College curricula afford students opportunities to develop and expand their use of metacognitive strategies in order to meet academic demands. The second hypothesis was that students would show growth in strategy use from freshman to senior years. This hypothesis was consistent with results in Taraban[23] with U.S. students. The third hypothesis was for epistemic beliefs. Engineering curricula place strong demands on students for precise and veridical knowledge. These demands are consistent with a transmission orientation to information. U.S. students in Taraban[23] showed an increased emphasis in transmission beliefs over transaction beliefs from freshman to senior years. Because of the high demands placed on engineering domain knowledge in Indian Institutes of Technology, the third hypothesis was that Indian students would show stronger transmission beliefs over transaction beliefs compared to U.S. students from freshman to senior years.

Research Methods

Participants

Three hundred thirteen students at an Indian Institute of Technology participated in this study voluntarily and without compensation. The comparison sample[23] consisted of 410 engineering majors at two U.S. universities. Both U.S. schools are large public universities in the west and southwest of the U.S. with well-established engineering programs. Based on the number of academic semesters completed, participants were classified as freshmen, sophomores, juniors, or seniors. All students participated voluntarily. The study in the U.S. was reviewed and approved by the respective Institutional Review Boards; in India, an institutional ethics committee reviewed and approved the research project.

Research Instruments

The materials included the MRSQ[12] and RBI[17]. The rating scales for both used a 5-point Likert scale. The rating scale for the MRSQ, which measured frequency of strategy use, was specified as follows: *I use this strategy* 1-Never, 2- Rarely, 3-Sometimes, 4-Often, 5-Always. A sample item reads: *I make notes when reading in order to remember the information*. The rating scale for the RBI, which measured a person's response to a statement, was specified as follows: *My response to this statement:* 1-Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree. Participants also responded to several demographic questions and an open-ended question about recent things they read. Four versions of each questionnaire were used, and the order of the MRSQ and RBI was counterbalanced across participants, in order to eliminate spurious effects in the data due to a specific ordering of questions. Demographic and open-ended questions always appeared at the end of the survey.

Procedure

Participants were recruited through undergraduate engineering courses. There was an attempt to target courses at every level from freshman through senior. The experimenter asked students to complete a paper-and-pencil survey concerned with how engineering students processed text materials. The survey was completed at the end of class periods and was returned to the experimenter. In all cases, students were asked to imagine that they were reading materials for school and to respond to all questions from that perspective. The reason for this directive was to learn how students processed information for school and not how they processed information in general.

Questionnaire Scoring and Statistical Methods

Each questionnaire was scored by taking the average of the ratings for each subscale (e.g., the analytic subscale). The outcomes of statistical analyses were considered significant when probability values (p values) were less than or equal to .05, which is a standard cutoff value. In the analyses of the MRSQ and RBI data, academic level (freshman through senior) based on completed credits is a between-subjects variable. Subscale ratings are within-subjects variables. Thus the analysis of variance (ANOVA) used a mixed model design appropriate for these data.

Results

The results for the MRSQ are discussed first. Figure 1A shows the U.S. data and Figure 1B shows the Indian data. The major findings, based on statistical analyses were as follows:

- Analytic strategies ($M = 3.52$, $SD = 0.47$) were applied significantly more frequently than pragmatic strategies ($M = 2.89$, $SD = 1.00$), for both U.S. and Indian students, [$F(1, 715) = 249.33$, $p < .001$].
- Indian students reported significantly more use of both analytic and pragmatic strategies ($M = 3.48$, $SD = 0.54$) than U.S. students ($M = 2.99$, $SD = 0.55$), [$F(1, 715) = 146.62$, $p < .001$].
- The difference between analytic and pragmatic strategy use was significantly greater for U.S. (*Mean Difference* = 0.881, $SD = 1.00$) than Indian (*Mean Difference* = 0.30, $SD = 0.95$) students, [$F(1, 715) = 61.88$, $p < .001$].
- There was weak but significant strategy growth overall, from freshman through senior years. This was due largely to growth in the use of pragmatic strategies for both U.S. and Indian students, [$F(3, 715) = 3.19$, $p = .023$]. The overall mean strategy use was 3.14 ($SD = 0.64$) for freshmen, 3.21 ($SD = 0.58$) for sophomores, 3.20 ($SD = 0.59$) for juniors, and 3.26 ($SD = 0.57$) for seniors.

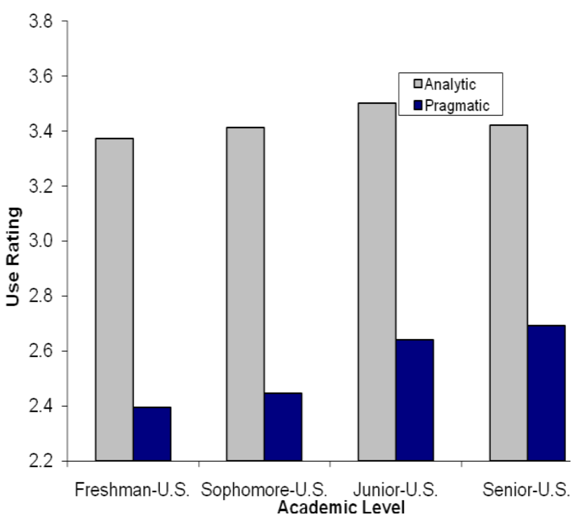

Figure 1A. Mean MRSQ Ratings by Level for U.S.students.[23]

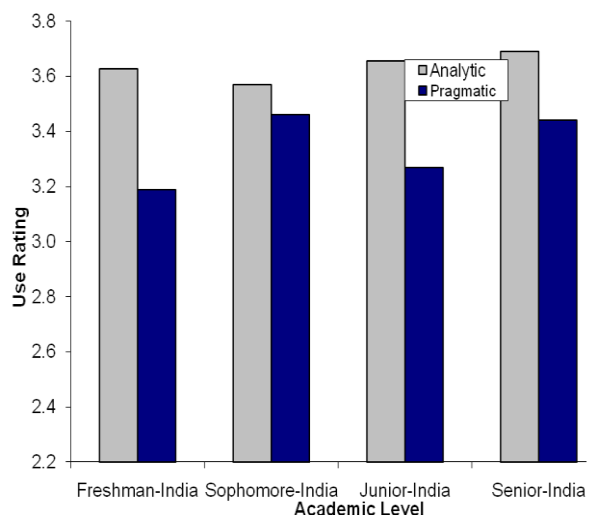

Figure 1B. Mean MRSQ Ratings by Level for Indian students.

The results for the RBI are discussed next. Figure 2A shows the U.S. data and Figure 2B shows the Indian data. The major findings, based on statistical analyses were as follows:

- U.S. and Indian students affirmed transaction beliefs (M = 3.62, SD = 0.61) significantly more strongly than transmission beliefs (M = 3.15, SD = 0.56), [F (1, 715) = 288.54, p < .001].
- Indian students affirmed transaction beliefs (M = 3.97, SD = 0.48) significantly more strongly than U.S. students (M = 3.36, SD = 0.58), [F (1, 721) = 225.99, p < .001].
- There was no significant difference in transmission beliefs between U.S. (M = 3.15, SD = 0.58) and Indian students (M = 3.14, SD = 0.54), [F (1, 721) = .01, p = .907)].
- Related to the previous point, there was a marginally significant interaction suggesting that transaction and transmission converge, from freshman through senior years, for U.S. students but not for Indian students, [F (3, 715) = 2.34, p = .072].

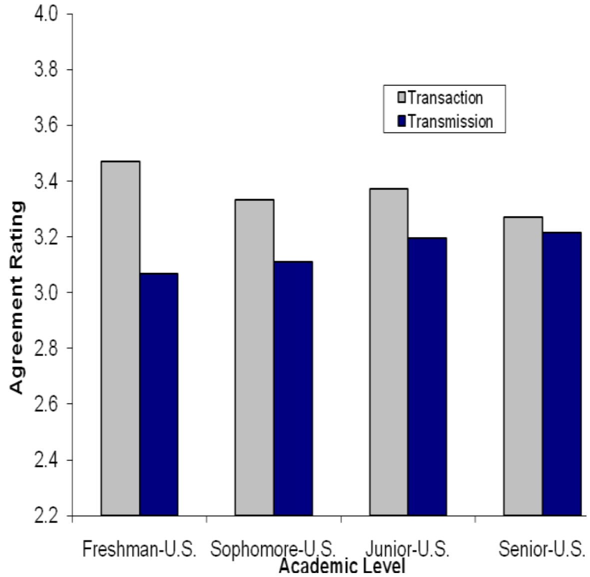

Figure 2A. Mean RBI Ratings by Level for U.S. students.[23]

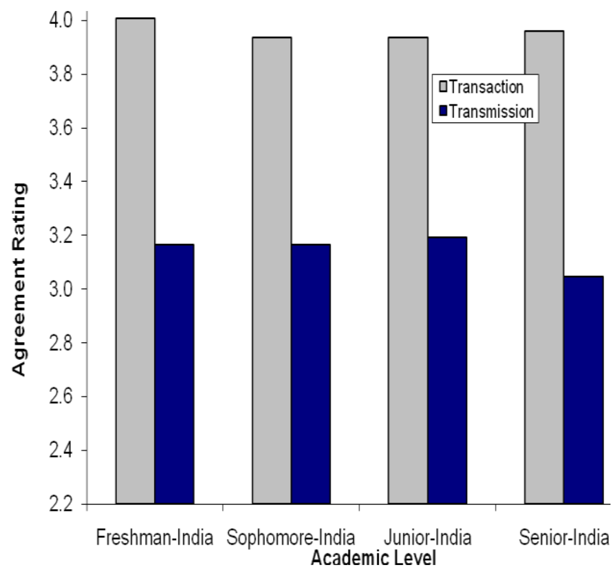

Figure 2B. Mean RBI Ratings by Level for Indian students.

After completing the MRSQ and RBI, participants were asked to respond to an open-ended question with the following instructions*: List 3 recent and specific purposes or reasons for reading as part of your academic work.* ***Avoid general responses like 'to learn more.'*** *Acceptable responses are 'I read the Sharat Chandra Chattopadhyay novella Devdas for Humanities class.' 'I read Ch. 3 in my Chemistry textbook in order to answer a problem set.' Note, that each response has 2 parts – one part states what you read (for instance, your Chemistry textbook), and the other part states your purpose in reading (for instance, for to prepare for a test).* Table 1A and 1B

List 3 recent and specific purposes or reasons for reading as part of your academic work. Avoid general responses like 'to learn more.' Acceptable responses are 'I read the Sharat Chandra Chattopadhyay novella *Devdas* for Humanities class.' 'I read Ch. 3 in my Chemistry textbook in order to answer a problem set.' Note, that each response has 2 parts – one part states what you read (for instance, your Chemistry textbook), and the other part states your purpose in reading (for instance, for to prepare for a test). Table 1A and 1B summarize the results.

	Primary Sources			Secondary Sources							
	Non-Fiction	Journal/ Article	Fiction	Textbook	Manual; Handbook; Guidebook; Reference	Website	Handout	Magazine; Newspaper	Student Class Notes	Unknown Source	SUM
Indian Students	5.33	4.44	13.10	52.72	6.22	3.98	3.55	4.55	5.33	0.78	100.00
U.S. Students	6.33	1.04	3.92	61.69	1.94	1.56	2.56	1.27	3.46	15.93	100.00
MEAN	5.83	2.74	8.51	57.21	4.08	2.77	3.06	2.91	4.40	8.36	100.00
z-test[a]	0.41	n.a.[b]	**4.36*** **	**2.35***	**2.82***	1.72	0.56	**2.51***	1.00	n.a.	

Table 1A. Mean percent of kinds of materials read by Indian (*N*=313) and U.S. (*N*=410) students
Notes. *[a]The z-test is a difference test for two proportions. [b]Because of statistical restrictions, tests were not conducted if either percent was based on a frequency less than 5. A p-value is considered significant if less than .05. Tests are two-tailed. *** $p < .001$, ** $p < .01$, * $p < .05$*

	Answer Question Set/ Homework	Exam/ Quiz	Essay/ Paper	Preview/ Review (Before or after class)	Lab	Expand Knowledge (Beyond what was presented in class)	Applications of what was presented in class.	Pragmatic (to some academic end, e.g. raise GPA)	Fun/ Pleasure Current Events/ Curiosity	Presentation/ Project	SUM
Indian Students	7.66	33.30	0.44	13.54	2.44	8.44	0.22	6.88	18.42	8.66	100.00
U.S. Students	31.94	22.64	2.37	6.46	0	23.24	0.76	4.37	4.79	3.43	100.00
MEAN	19.80	27.97	1.41	10.00	1.22	15.84	0.49	5.63	11.61	6.05	100.00
z-test	**7.80*** **	**2.91** **	n.a.	**3.23** **	n.a.	**5.13*** **	n.a.	1.29	**5.61*** **	**2.89** **	

Table 1B. Mean percent of purposes for reading for Indian (*N*=313) and U.S. (*N*=410) students

Significant differences between Indian and U.S. students in Tables 1A and 1B were tested using a *z*-test; *z*-values that are significant are shown in bold font and marked with asterisks.

Discussion

The materials and methodology in this research study provide a quantitative comparison of U.S. and Indian students' use of metacognitive strategies and their epistemic beliefs about text in academic settings. The hypothesis that Indian students would apply pragmatic strategies over analytic strategies when reading for academics, compared to U.S. students, was not confirmed. Indeed, the results showed that Indian students used analytic strategies significantly more than pragmatic strategies. However, follow-up analyses showed that the difference between analytic and pragmatic strategies was smaller for Indian students compared to U.S. students (see Figures 1A and 1B), suggesting that Indian students were more dependent on pragmatic strategies than U.S. students. This latter finding is consistent with the ESL data in Razi[22] and Vianty[21] and suggests that Indian students draw significantly on pragmatic strategies to extract and organize basic information. These students may rely more heavily on pragmatic strategies as a compensatory mechanism for reading outside their native language.

As indicated earlier, it was not possible to form a clear hypothesis about whether Indian students would use analytic strategies more than U.S. students. The results showed that indeed Indian students did use analytic strategies more than U.S. students. Combining this with the prior findings of significantly higher use of pragmatic strategies, suggests that Indian students are active information processors who readily use pragmatic strategies to draw out and mark up information at a basic level and build on that basic organization through the application of analytic strategies to facilitate deeper comprehension of the information.

The hypothesis that Indian students would show growth in strategy use was upheld. A closer analysis of the results showed significant growth only for pragmatic strategies. This was true for U.S. students as well. One possible explanation is that highlighting and annotating text becomes increasingly useful as information-processing demands grow as students progress through the curriculum. It is not clear, though, why students did not show growth in analytic strategies as well. Razi[22] showed significant growth in analytic and pragmatic strategy use through a six-week intervention, indicating that it was possible to increase metacognitive processing in college students. The success of deliberate interventions suggests that engineering curricula may profit from implementing explicit activities to increase students' metacognitive processing of information.

The hypothesis that Indian students' preference for transmission beliefs over transaction beliefs would increase from freshman to senior years was not confirmed. Indian students did not replicate the pattern found in the U.S. data. Follow up analyses showed that Indian students affirmed transaction beliefs more strongly than transmission beliefs. Indian and U.S. students did not differ on transmission beliefs. This implied that Indian students were more inclined to interpret, evaluate, critique, and respond to information, than simply accept information on the authority of the author.

Data on students' academic reading, summarized in Tables 1A and 1B, indicated that Indian students spent considerably more time than U.S. students reading non-academic materials, like newspapers and novels, for entertainment, to keep up with current events, and other non-academic purposes. Compared to U.S. students, the Indian students also read more journals and handbooks for academic purposes. It is plausible that the diversity of reading materials, particularly those that afforded critical thinking, allowed Indian students to achieve significantly higher transaction scores than U.S. students and protected Indian students from becoming more transmission oriented and less transaction oriented from freshman to senior years as the U.S. students did.

The findings here need to be interpreted in context. One of the motivations of this paper was to see how non-native English speaking students compare to native speakers in the U.S. However, it is not clear to what extent the "non-native" attribute can be applied to Indian students in this sample, who are some of the best-educated and most accomplished students in India, and who grow up as if English is their native language. Indeed, Indian students may have bilingual or multilingual facility with English and other languages. The present findings represent two data points for cross-cultural differences among engineering students. Given the academic stature of IIT students, students of comparable achievement and ability need to be surveyed in the U.S. and elsewhere.

The present study has sketched out a paradigm for learning more about differences between engineering students in a global context and has provided a rubric for systematically gathering data in order to better understand cross-cultural differences. Broader sampling is certainly warranted in India as well as other non-Western countries, and in the U.S.

Conclusions

This paper examined metacognitive strategy use and beliefs about the kinds of knowledge gained from text. It is the first study to use these measures to quantitatively describe cross-cultural differences in engineering student thinking and development in an integrated fashion. The goal in using the MRSQ and RBI was to learn more about the development of information fluency in engineering students. Students for whom English is not a native language may be challenged by processing information outside their native languages. The data for the Indian sample indicate that these students can, nonetheless, draw on metacognitive strategies as proactive as well as compensatory mechanisms in order to amplify their comprehension of text.

The high achievements of Indian students in applying analytic strategies and affirming transaction beliefs sets a high benchmark for engineering undergraduates. The success of interventions to boost metacognitive processing[22] and critical thinking[24] indicate that facilitating and supporting deliberate growth in these factors is a viable possibility for curricular change that would yield positive benefits. Overall these and related findings provide support for ongoing initiatives to include more design projects, problem-based learning, cooperative education (co-op) experiences, and professional internships in engineering programs in order to continue to develop students' abilities to analyze, interpret, critique, and respond personally to information, particularly in the context of ambiguity and the ill-defined problems that characterize professional practice.[25-27]

Recommendations in *Educating the Engineer of 2020*[28] include providing engineering majors with more breadth in the humanities. Including humanities courses across the freshman through senior years for U.S. students, particularly courses that include materials besides textbooks, may help students retain and develop a transactional and constructivist orientation to information and knowledge to a larger extent than is currently occurring. It may also assist them in more deeply appreciating the environmental, social, ethical, and political obligations that come with professional practice. There is a wealth of expository materials available to engineering students that probe humanistic issues, including sustainability, ethics, diversity, equality, gender, and social justice. A limitation to the present study is that it used a single sample of students who were working academically in a non-native language. IIT students represent a highly-select group based on motivation and ability. Future research should collect additional samples at other levels of ability and for other language groups.

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Appendix

Metacognitive Reading Strategies Questionnaire (MRSQ)[12]

Analytic Reading Strategies

1. As I am reading, I evaluate the text to determine whether it contributes to my knowledge/understanding of the subject.
2. After I have read a text, I anticipate how I will use the knowledge that I have gained from reading the text.
3. I try to draw on my knowledge of the topic to help me understand what I am reading.
4. While I am reading, I reconsider and revise my background knowledge about the topic, based on the text's content.
5. While I am reading, I reconsider and revise my prior questions about the topic, based on the text's content.
6. After I read the text, I consider other possible interpretations to determine whether I understood the text.
7. As I am reading, I distinguish between information that I already know and new information.
8. When information critical to my understanding of the text is not directly stated, I try to infer that information from the text.
9. I evaluate whether what I am reading is relevant to my reading goals.
10. I search out information relevant to my reading goals.
11. I anticipate information that will be presented later in the text.
12. While I am reading, I try to determine the meaning of unknown words that seem critical to the meaning of the text.
13. As I read along, I check whether I had anticipated the current information.
14. While reading, I exploit my personal strengths in order to better understand the text. If I am a good reader, I focus on the text; if I am good with figures and diagrams, I focus on that information.
15. While reading I visualize descriptions to better understand the text.
16. I note how hard or easy a text is to read.

Pragmatic Reading Strategies

17. I make notes when reading in order to remember the information.
18. While reading, I underline and highlight important information in order to find it more easily later on.
19. While reading, I write questions and notes in the margin in order to better understand the text.
20. I try to underline when reading in order to remember the information.

*21. I read material more than once in order to remember the information.
*22. When I am having difficulty comprehending a text, I re-read the text.

Reader Belief Inventory (RBI)[17]

Transaction Statements

*23. I like the fact that two people can read the same book and disagree about what it means.

24. I often have strong emotional responses to what I read.
25. When I read, I like to imagine I am living through the experience too.
26. I enjoy interpreting what I read in a personal way.
27. Reading for pleasure is the best kind of reading.
28. I enjoy sharing the thoughts and reactions of characters in a book with others.

Transmission Statements

29. The main purpose of reading is to understand what the author says.
30. When I read, I try to carry away exactly what the author meant.
31. People should agree on what a book means.
32. I like books where you know exactly what the author means.
33. When I read, I focus on what the author says is important.
34. Most books mean exactly what they say.

Notes. Items marked with an asterisk were not used in the analyses and results, based on the recommendations generated in confirmatory factor analyses. The rating scale for the MRSQ was as follows: *I use this strategy* 1-Never, 2- Rarely, 3-Sometimes, 4-Often, 5-Always. The rating scale for the RBI was as follows: *My response to this statement:* 1-Strongly Disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly Agree. Four items in the RBI (Schraw, 2000) that did not load (DNL) in excess of .40 on a factor were not used in this study.