

Chemical Engineering Education READER SURVEY

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Research journals in engineering education have been reasonably extensively studied using citation and reference discipline analyses.^[1-3] On the other hand, chemical engineering education journals have seldom been studied. The one exception is a citation analysis of engineering education papers cited in *Chemical Engineering Education (CEE)* and the citation of *CEE* papers in other engineering education journals.^[4] The current study looks at a different aspect of chemical engineering education publishing—what are the experiences of *CEE* readers and authors.

In 2004 surveys were hand-delivered, and in 2018 either hand-delivered or sent by email to likely readers of *CEE*. The 2004 survey was administered at the Chemical Engineering Division (ChED) of the American Society for Engineering Education (ASEE) banquet at the ASEE Annual Meeting which was held in Salt Lake City, Utah. The 2018 survey was also administered at the ChED banquet which happened to also be held in Salt Lake City. The 2018 survey was also sent by email to the attendees of the 2017 ChED Summer School held at North Carolina State University, to the members of the *CEE* Publications Board, and to former *CEE* authors. As much as possible, the 2018 survey was identical to the 2004 survey.

SURVEY QUESTIONS AND RESULTS

The survey questions, the detailed numerical and average results for the 2018 survey and the average numerical results for the 2004 survey, and all the comments from 2004 and 2018 are given in extensive Figures 1 to 7 and in Tables 1 to 3. The entire survey was six pages long. Questions #1 and #2 of the survey requested job description data and whether respondents had read any parts of *CEE* in the previous year.

1. Your job description: Numbers in () are 2004 responses
 Regular Chemical Engineering faculty: Yes 57 (28), No _____
 Chemical Engineering Adjunct faculty: Yes 1, No _____
 Chemical Engineering Visiting faculty: Yes _____, No _____
 Chemical Engineering Instructor: Yes 6, No _____
 Chemical Engineering Post-Doc: Yes 1, No _____
 Retired ChE faculty: Yes 1 (3), No _____
 Other faculty: Yes 1, No _____; Identify discipline Environmental Engineering
 ChE graduate student: Yes 3, No _____
 Other graduate student: Yes 1, No _____; Identify discipline Engineering
 ChE Undergraduate student: Yes _____, No _____
 Other (1, administrator)
2. Have you read any parts of *CEE* issues in the last year? Yes 53 (32), No 18 (3)
 If no, please skip to Question 8.

Figure 1. Results for questions #1 and #2 of *CEE* readership survey for all 2018 and all 2004 respondents.

- Question 3. When you receive *CEE* do you (circle all that apply):
 a) check the table of contents or front cover 39 (26)
 b) turn to a specific feature – if so, which feature 2 (8) random thoughts, 2 comics
 c) skim through the entire journal 23 (20)
 d) read from cover-to-cover 1 (2)
 e) look for articles of interest 39 (22)
 f) look for authors you know 24 (14)

Figure 2. Results of the 2018 and 2004 surveys of *CEE* readers on how respondents approach reading *CEE*.

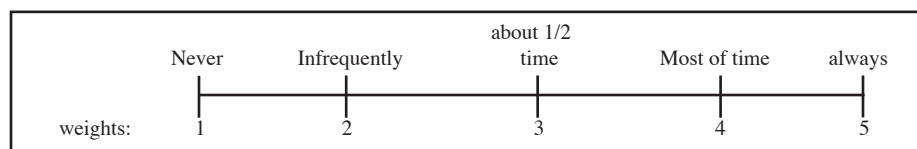
The results for all 2018 and 2004 respondents are given in Figure 1.

The 18 respondents who had not read *CEE* are an easily identifiable group that may have different characteristics than other respondents. To determine if the jobs held by these respondents are different, their answers to question #1 were counted separately. There were 14 ChE faculty, one other faculty, two ChE graduate students and one other graduate student.

Question #3 requested information about how respondents approach reading *CEE* when they first view a new issue. The questions and the numerical results are reported in Figure 2.

Question #4 asked respondents to “Please rate the frequency that you read the following features or articles

in an issue.” and question #9 requested respondents to “Please rate the frequency that you read other engineering education journals or magazines.”



For both these questions the frequency scale (Figure 3) was shown for all 28 items in question #4 and for all eight items in question #9. The detailed results for question #4 are shown in Table 1.

Figure 3. Frequency scale used for all items in questions 4 and 9. The weights for each answer were used to calculate numerical scores, but were not shown in the questionnaire. The last item “always” was changed to “every issue” for question 9.

Question #5, “In the fall issue, what percentage of the departmental ads do

TABLE 1
Detailed results for 2018 Respondents and averages for both 2004 and 2018 for question #4, “Please rate the frequency that you read the following features or articles in an issue:”

Feature or Article	never	infrequently	about ½ time	most of time	always	2018 average	2004 average
Random Thoughts Felder’s column (before Felder retired)	1	12	4	12	21	3.8	4.5
Teaching Tips	2	5	8	27	10	3.7	4.1
Pedagogy (teaching methods)	4	6	17	19	6	3.3	4.1
Drawn to Engr. comic	8	9	8	10	13	3.2	NA
Class/home problems	3	12	20	9	3	2.9	3.4
ChE dept. profile	3	21	11	11	5	2.9	3.0
ChE educator profile	2	19	9	13	7	2.8	3.5
Laboratory	6	18	15	6	6	2.8	3.4
Editorials	4	21	9	13	4	2.8	3.2
Surveys	7	15	18	6	3	2.7	3.6
Lifelong Learning*	9	18	12	10	2	2.6	2.9
Lectures	5	18	18	3	2	2.5	2.9
Book reviews	16	21	7	6	1	2.1	2.6
Classroom papers on following topics (assuming topic is available)							
Mass & Energy Bal.	6	13	10	10	12	3.2	3.3
Reactor Design & Kinetics	11	13	17	6	7	2.7	3.2
Separations	13	13	7	11	7	2.7	3.1
Transport Phenomena	5	17	4	14	4	2.7	3.0
Thermodynamics	11	17	9	6	9	2.7	2.7
Materials	14	12	11	13	3	2.6	NA
Design	13	18	7	9	5	2.5	3.1
Computers	12	17	8	11	2	2.5	2.6
Statistics & Design of Experiments	14	13	11	9	2	2.4	3.0
Mathematics	15	18	7	7	3	2.2	2.7
Biochemical Engr.	17	19	6	8	2	2.1	2.6
Biomedical Engr.	18	21	6	5	2	2.1	NA
Control	19	20	6	4	2	2.0	2.3
Other Topics	6	5	5	0	2	**	**
Other Paper/Feature	3	3	2	0	1	**	**

* in 2004 title was Learning in Industry.

** insufficient data.

you look at?” used the scale shown in Figure 4, which also shows the results for question #5.

Question #6 explored the experiences of respondents who had submitted articles to CEE. The questions and numerical results are given in Figure 5. Respondents who reported some difficulties in the publication process were asked to comment on the difficulties. All of the comments received are included in Figure 6. Question #7 asked if the respondent had any suggestions for improvement of CEE. All of the

comments are given in Figure 7. Results for question #8 on the availability of CEE are given in Figure 8.

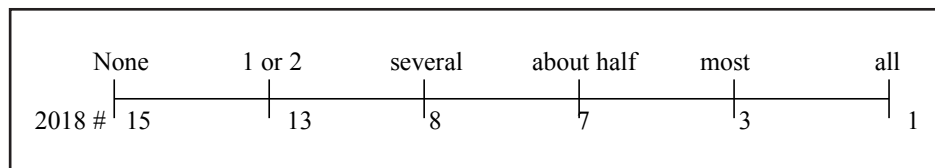


Figure 4. Frequency scale used for question # 5, “In the fall issue, what percentage of the departmental ads do you look at?” The number of 2018 respondents selecting each answer is included underneath the scale. The weights of each item went from 1 for “None” to 6 for “all.” The average in 2018 was 2.4 and the average in 2004 was 2.3.

Question 6. Have you ever submitted an article to CEE? 2018: Yes 27; No 7 (if no, please go to question 7). 2018: Yes = 79%. 2004: Yes = 72%

a) Did you feel the review process was fair? 2018: Yes 27; No 0; 2004: Yes 23; No 0

b) Was the time required for the review process reasonable? 2018: Yes 27; No 1; 2004: Yes 19; No 4

c) If your article was published, was the time to publication (after review was completed) reasonable? 2018: Yes 20; No 3; 2004: Yes 22; No 0 (1 in press)

d) Were CEE personnel polite and professional during their contacts with you? 2018: Yes 26; No 0; 2004: Yes 23; No 0

Figure 5. Detailed numerical results for 2018, averages for 2018 and 2004 for Question #6.

Question #6 continued, if you answered no to any of question 6, please comment on the difficulties.

2018: “Long delay for 1 article once, normally process has been reasonable.”

“Sometimes a little long, the most recent spring edition seemed to come out late.”

“I did not answer no, but submitted an article to the ASEE Chemical Engineering Summer School special editions and publication will not be until Summer 2019, when the article was submitted March 2018. I knew this going in so I am okay with it, but the time to publication is long and since I am a pre-tenure faculty it would have helped having the article published sooner.”

“Just a long time between submission and when it finally ends up in the print issue.”

2004: “Review took 8 months! Too long!”

“Time to publication & thru review a little long.”

“1 positive and negative review received. Did not get feedback until e-mailing Tim & Carole [editor and managing editor]. Was able to make corrections afterwards, but then a 3rd review (positive) came in.”

Other comments on the CEE publication process?

2004: “Great variability in review time.”

“Was able to talk personally with Tim and Carole [editor and managing editor] – they were very helpful.”

“Generally ok – but we could all benefit by faster reviews.”

Figure 6. All comments from respondents on submission and publication of articles in CEE (Question #6).

2018 Suggested Improvements:

- *“The website is very hard to navigate and does not allow for searches of the journal (UF site) I found another site that is a CEE site that did allow me to search, which was helpful. Not having the ability to look up articles online I am sure hurts readership and the broad dissemination of information from the journal.”*
- *“Make it easier to purchase a paper subscription—it’s a little weird/outdated that I had to write a check, and I am honestly not sure how to re-up the subscription after one year-do I have to remember to send another check? Do you send a reminder?”*
- *“Consider obtaining an impact factor.”*
- *“It might be worthwhile to invite the best ASEE and AIChE presentation every year to present a paper. Also the online searching capabilities are better, but still not industry standard.”*
- *“Make back issues available similar to the current issues, i.e. click on an issue and then click on individual article.”*
- *“For the back issues, when you click on “All Volumes,” you get a list of years which then allows you to click on the “plus sign” to get the individual issues. However, the 5-year index provides the “volume number” and not the “year.” Can the number be added next to the year?”*
- *“I like the Eng. Ed. Papers more than the applied/lab papers.”*
- *“We had some issues with a CEE manuscript that was lost after it was submitted to the editor. This caused some delays and resulted in us having to do additional assessment due to the start of a semester (we submitted the manuscript before the start). It wasn’t a major inconvenience, but it did require more work.”*
- *“Possibility of color for online copies only.”*
- *“It would be nice to have some themed issues dedicated to papers/comments/etc. from younger faculty.”*
- *“Make an audio version.”*
- *“N/A. Although I have never published in CEE, I plan on within the next two years.”*
- *“Modernize.”*
- *“Get journal indexed.”*
- *“Get DOIs for articles”*
- *“Make grad guide more meaningful/interactive.”*
- *“Accessibility! CEE is more obscure than it should be because it is difficult to access and not indexed by the major journal indexing operations (e.g. Web of Science).”*
- *“E-mail table of contents to ASEE ChE and/or AIChE Education Division members when new issue is published.”*
- *“Yes. I checked the special issue on diversity looking for an opinion directly coming from a minority in the field and I could not find it. It would be an interesting addition.”*
- *“Make this survey electronic in the future. Google forms are an easy way to do anonymous surveys and get feedback collected as a spreadsheet.”*
- *“I understand that CEE is run on voluntary basis but it will be good to have access to electronic copies. Also a reminder to renew the subscription will be nice. I am not sure if this already exists for people in the USA, but it does seem to exist for overseas readership. I will be happy to pay to access an electronic subscription instead of paper copy if it was possible.”*

2004 Suggested Improvements:

- *“Update design of cover.”*
- *“Post all articles online w/ a nice indexing system.”*
- *“Provide rubrics as to how article is evaluated for publication.”*
- *“Maybe more photographs.”*
- *“Upgrade website.”*
- *“Make back issues (full articles) available online.”*
- *“Modernize the look. Add some smaller ‘notes’ or news or tidbits.”*
- *“Consider separating into 2 sections – education research and ‘other’ (show & tell, departments features, person features).”*
- *“Give reviewers a shorter turnaround – make article review process electronic – no paper or review mailing.”*
- *“Put on the web. Get journal in citation system. Some faculty won’t publish in CEE because of these factors.”*

Figure 7. All comments from question #7, “Do you have any suggestions for improvement of CEE?”

Question #9 asked respondents to rate the frequency they read other engineering education journals. The frequency scale in Figure 1 (without the weights) was shown for every journal listed. Results for all 2018 respondents and the average frequencies for 2018 and 2004 are presented in Table 2. Results for question #9 for the 18 respondents who had not read CEE are shown in Table 3.

INTERPRETATION OF RESULTS

The respondents for the 2004 and 2018 surveys have different characteristics. The attendees at the 2017 ChED summer school were new faculty who were less likely to be familiar with CEE than the faculty attending the ChED banquet at the ASEE Annual Meeting. The results from question #1 (Figure 1) show a total of 11 instructors, graduate students, and postdocs filled out the survey in 2018 while there were no respondents from these categories in 2004.

The percentage of respondents who had not read any part of CEE in the last year (question #2, Figure 1) was $18/71 \times 100 = 25.4\%$ for the 2018 survey and was $3/35 \times 100 = 8.6\%$ for the 2004 survey. The job classifications of the 18 respondents who had not read CEE show the following differences:

they were more likely to be graduate students (three of the four graduate students are in this group), the one non-ChE professor is in this group, and perhaps surprisingly there were no postdocs in this group. Since respondents who had not read CEE were instructed to

skip to question #8, these respondents do not affect the answers to questions 3 through 7.

The pattern of answers to question #3 (Figure 2) is what would be expected for readers who will be selective in choosing the articles to read. Question #4 asked respondents to rate the frequency that they read vari-

8. Availability of CEE. Please check those that apply. The number in () is 2004 data.
• I have my own subscription <u>7</u> (7)
• My dept. has a bulk subscription and a personal copy is delivered to me <u>14</u> (24)
• My dept. circulates copy(ies) of CEE to faculty <u>20</u> (3)
• My dept. or library has an electronic copy that I can access <u>28</u> (option not available in 2004)
• Sometimes CEE is available in department <u>7</u> (1)
• I have to go to the library to read CEE <u>5</u> (2)
• I have no idea what CEE is <u>3</u> (0)

Figure 8. Results for question #8 about the availability of CEE.

TABLE 2							
Results for all 2018 respondents and averages for 2018 and 2004 respondents for question #9, "Please rate the frequency that you read other engineering education journals or magazines."							
Other Engineering Education Journal	never	infrequently	about ½ time	most of time	Every issue	2018 average	2004 average
ASEE PRISM	25	16	5	15	6	2.4	3.9
J. Engr. Education	20	25	11	10	2	2.3	3.3
Advances in Engr. Educ.	25	28	8	3	1	1.9	NA
Intl. J. Engr. Educ.	37	18	7	3	0	1.6	1.8
European J. Engr. Educ.	40	20	5	3	1	1.6	NA
IEEE Transactions Educ.	43	18	4	0	0	1.4	1.3
ASCE J. Prof. Issues	51	11	1	0	0	1.2	1.2
Other: J. Name:							
J. Chem. Educ.	-	1	2	0	0	**	**
** insufficient data							

TABLE 3						
Results for 2018 respondents who had not read CEE for question #9, "Please rate the frequency that you read other engineering education journals or magazines."						
Other Engineering Education Journal	never	infrequently	about ½ time	most of time	Every issue	2018 average
ASEE PRISM	13	3	0	1	0	1.3
J. Engr. Education	8	7	1	1	0	1.7
Advances in Engr. Educ.	10	5	0	1	0	1.5
Intl. J. Engr. Educ.	11	4	1	0	0	1.4
European J. Engr. Educ.	12	4	0	0	0	1.2
IEEE Transactions Educ.	12	4	0	0	0	1.2
ASCE J. Prof. Issues	11	4	0	0	0	1.3

ous features or articles. All except one of the features/articles listed in question #4 that appeared in both 2004 and 2018 had lower frequencies of readership in 2018 than in 2004 (Table 1). The exception was thermodynamics, which had equal frequency of readership in the two years. Lower frequencies of readership may reflect the different demographics in 2004 and 2018 or they may be caused by more demands on the time of ChE professors in 2018.

The five features/articles with the highest frequency of readership in 2018 were: Random Thoughts 3.8; Teaching Tips (TT) 3.7; pedagogy 3.3; Drawn to Engineering comic 3.2; and mass & energy balances 3.2. In 2004 the Drawn to Engineering comic was not available. The five features/articles with the highest frequency of readership in 2004 were: Random Thoughts 4.5; pedagogy 4.1; TT 4.1; surveys 3.6; and ChE educator profiles 3.5. The highest frequency of readership in 2004 of a classroom paper was mass & energy balances, 3.3. The first TT appeared in Spring 2004 and the survey was administered in June 2004; thus, readers were remembering a single recent column. Since TTs and pedagogy are both papers on improving teaching but are of different lengths, it is not surprising that the frequencies of readership are similar. TTs are shorter (one page) and were read more frequently in 2018 than peer-reviewed pedagogy papers.

In 2018 the five features/articles with the lowest frequency of readership were: control 2.0; book reviews 2.1; biomedical engineering 2.1; biochemical engineering 2.1; and mathematics 2.2. Biomedical engineering was not listed as a separate category in 2004. In 2004 the features/articles with the lowest frequency of readership were: control 2.3, book reviews 2.6; biochemical engineering 2.6; computers 2.6; and mathematics and thermodynamics tied at 2.7. I wish to emphasize that readership frequency for classroom papers is highly dependent on the interests of the readers and may have no correlation with the quality of the papers.

Comparison of the more frequently read papers with those that are read less frequently shows two distinct patterns. First, more frequently read papers are less specialized. Random Thoughts, TT, and Drawn to Engineering can be read and understood by all chemical engineering professors. For classroom papers the vast majority of chemical engineering professors are capable of understanding papers on mass and energy balances without a great amount of effort. On the other hand, control, biochemical and biomedical engineering, and mathematical papers are often significantly more difficult to understand. Second, shorter papers are more likely to be read. Teaching Tips are limited to one page, Random Thoughts was two pages, and Drawn to Engineering is two pages.

The loss of the most frequently read feature, Random Thoughts by Rich Felder—when Rich retired from writing the column (years after he retired from North Carolina State University)—was a significant concern to the *CEE* editors. The high regard *CEE* readers had for Felder's column is

shown by the high frequency rating his column received over a year after his last column in Winter 2017. The relatively high frequency ratings of Lucas Landherr's graphic essay (or comic) Drawn to Engineering, which filled the two pages that became available when Rich Felder retired, are a relief. Obviously, the editors of *CEE* are pleased when features/articles show high readership frequency. However, if classroom papers are of high quality and are useful to readers interested in that category, low readership frequency is not a significant concern. Since book reviews do not serve readers teaching a particular ChE subject, the continued low frequency for book reviews is a concern.

Question #5 asked what percentage of the departmental ads were looked at. A slightly higher percentage of departmental ads were looked at in 2018 than in 2004 (Figure 4) although the difference is probably not significant. Departmental ads are very important to *CEE*'s financial health. The *CEE* budget model developed by *CEE*'s Publication Board and its former editor, Ray Fahien, relies on departmental support through advertisements for the majority of income. Departmental support allows *CEE* to offer both print and electronic subscriptions at significant savings and for *CEE* to continue publishing papers with no page charges. Because of departmental concern that few potential graduate students see the ads, *CEE* contracted with ChE Professor Jason Bara's company to develop a *CEE* Apple iPhone app containing the departmental ads (<<https://itunes.apple.com/us/app/cee-grad-guide-2017-18/id1048394040?mt=8>>). Several department heads have indicated that the *CEE* app was a major reason they renewed their graduate ad.

The experience of respondents who were *CEE* authors was generally positive since they believed the process was fair and that *CEE* personnel were polite and professional (Figure 5). However, the comments (Figure 6) indicated concern in 2018 about time to publication and in 2004 about time in review. All journals that use peer reviewers have difficulty obtaining timely reviews. The *CEE* editorial team works to reduce reviewers' workload by eliminating inappropriate manuscripts and asking authors to fix obvious shortcomings in otherwise appropriate papers during an initial editor's review. Since time for review was not an issue in the 2018 responses, *CEE* appears to have decreased the time to review when submission of papers, of requests to review, and return of reviews was switched to email in 2004. Unfortunately, concerns have now shifted to time to publication, which in some ways is a more difficult problem. The recent shift in 2018 to an automated online system for requesting reviews should further decrease time to review that will on average decrease time to publication. Unfortunately for the print version of *CEE*, a paper that misses being included in an issue by even one day will be delayed until the next issue, and since *CEE* is a quarterly, the paper has to wait three months for print publication of the next issue. Papers in special issues can also be delayed since

slower papers often control the publication date. On occasion, an author's slow response to requests for changes in a paper contribute to the length of time to publication. Finally, it is the responsibility of all *CEE* editors to process papers in a timely fashion to avoid unnecessary increases in time to review and time to publication.

Question #7 asked for suggestions for improvement of *CEE*. Figure 7 lists all of the suggestions received in 2004 and in 2018. With the exception of citation indices suggestions, which have been partially implemented, all of the 2004 suggestions have been implemented. Many of the 2018 suggestions have also been implemented or are under development. For example, all back issues are online. *CEE* now has an electronic edition with color photographs, and *CEE* strongly encourages electronic subscriptions. *CEE* is actively working toward assigning DOI to articles. All registered digital readers and subscribers can sign up for emailed notifications when a new issue is published. *CEE* has successfully made *CEE* papers more visible to Google and all *CEE* papers since 2014 are included in Google's citation index. Unfortunately, *CEE* has tried unsuccessfully to be part of Thompson Science Citation Index three times, and *CEE* will be dropped from Scopus in 2019.

Question #8 (Figure 8) requested information on how people access *CEE*. The really important news here is the significant growth in electronic subscriptions and electronic access in three years. Electronic subscriptions are available at <<http://www.che.ufl.edu/cee/>>, and in 2019 the price for a departmental electronic subscription that can be shared with the entire department has dropped to \$75 per year, which is a low price for an engineering education publication.

Table 2 presents the data on other engineering education journals read by all the respondents (question #9). The overall results show a significant drop in the frequency of reading the two most popular sources—*ASEE PRISM* and the *Journal of*

Engineering Education—from 2004 to 2018. Two journals with very low reader frequencies did not decrease from 2004 to 2018: *IEEE Transactions on Education* showed an increase from 1.3 to 1.4 and *ASCE Journal of Professional Issues* was constant at 1.2. Comparing the results for question #9 for the 18 respondents who had not read *CEE* (Table 3) with the results in Table 2 shows that the non-readers of *CEE* have a lower frequency of reading the other engineering education journals with the exception of the *ASCE J. of Professional Issues* which had a slightly higher frequency.

SUMMARY

The frequencies of reading *CEE* articles (Table 1) and other engineering education journals (Table 2) in 2018 were generally lower than in 2004. The most frequently read papers in the 2018 survey were Random Thoughts, Teaching Tips, pedagogy papers, Drawn to Engineering comic, and mass & energy balances papers. Compared to other *CEE* papers the most frequently read papers are less specialized and relatively short. The authors of *CEE* papers are generally satisfied with the publication process, but would like faster publication and inclusion of papers in citation indices. Electronic subscriptions have increased significantly in three years and are a bargain for departments.

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