Using the table of contents to analyze moves and steps in final-year engineering reports

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Final-year engineering reports

- Final-year engineering project reports are supervised year-long projects that undergraduate students undertake before graduation. Project guidelines are provided but they are often brief, taking into account the diversity of projects undertaken even within a certain discipline.

Table of contents (TOC)

- Functions as a preliminary section to provide an overview to the reader with regards to the contents of the report
- The value of the TOC as a teaching and learning tool is often not recognized - the TOC is written after the entire report has been finalized.
  - This paper suggests that TOC can be used as a formative feedback tool to facilitate faster and clearer analysis of moves and steps. The assumption is that if the heading or subheading appears in the TOC, it is an important move or step to the subject matter discussed

Genre theory

- The ESP pedagogy using genre analysis purports that each type of writing has its own conventionalized schematic structure and specialized vocabulary for the discourse community targeted.
- Swales (1990) identified the schematic structure for research articles in terms of moves where each move is elaborated on using several steps. These moves and steps identify the types and sequence of the information presented in the various sections of a research article qualitatively.

Swales 1990 – Create a Research Space (CARS) model

Move 1 Establishing a territory

- Step 1 Claiming centrality and/or
- Step 2 Making topic generalization(s) and/or
- Step 3 Reviewing items of previous research

Move 2 Establishing a niche

- Step 1A Counter-claiming or
- Step 1B Indicating a gap or
- Step 1C Question-raising or
- Step 1D Continuing a tradition

Move 3 Occupying the niche

- Step 1A Outlining purposes or
- Step 1B Announcing present research
- Step 2 Announcing principal findings
- Step 3 Indicating Research Article structure

Swales 2004 – revised CARS model

Move 1: Establishing a territory (citations required)* via**
Topic generalizations of increasing specificity
Move 2: Establishing a niche (citations possible)* via**
Step 1: Indicating a gap
Step 2: Adding to what is known
Step 3: Presenting positive justification (optional)
Move 3: Presenting the present work via
Step 1: Announcing present research descriptively and/or purposively (obligatory)
Step 2: Presenting research questions or hypotheses* (optional)
Step 3: Definitional clarifications (optional)*
Step 4: Summarizing methods (optional)*
Step 5: Announcing principal outcomes (PISF**)
Step 6: Stating the values of the present research (PISF**)
Step 7: Outlining the structure of the paper (PISF**)

** Steps 2–4 of Move 3 are optional and not fixed in order.*
*** PISF (Probable in some fields)*
**** Moves 1 and 2 are likely to be cyclical, especially in longer introductions.*

Changes in 2004 version mainly in terms of the exclusion of the three steps in Move 1 and addition of steps in Move 3

Genre analysis and studies on sections of the research article

- Introduction (Anthony, 1999; Kanoksilapatham, 2011, 2012; Posteguillo, 1999; Ozturk, 2007)
- Method (Bruce, 2008; Lim, 2006; Peacock, 2011)
- Results (Basturkmen, 2009; Brett, 1994; Bruce, 2009; Williams, 1999)
- Discussion (Basturkmen, 2012; Holmes, 1997; Peacock, 2002)

Weaknesses in genre-based studies

- Kanoksilapatham (2015)
  - Studies focus on individual sections of research articles – fragmented knowledge of each section
  - Small datasets (10-20) – findings ungeneralizable
  - Representativeness of corpora is questionable – journals are nominated by individuals
  - Subjective nature of the analysis – analysis not conducted by subject-matter experts

Visual communication

- Visual communication is communication through a visual aid and is described as the conveyance of ideas and information in forms that can be read or looked upon (Wikipedia)
- Theories of visual communication (Suris, n.d.)
  - Sensual theories
    - Gestalt (the eye sees various stimuli and our minds assemble the parts into an image via similarity, continuity, proximity and common fate)
    - Constructivism (active perception and eye movement in forming an image) e.g. content, size and placement of photos on newspaper page are more important than the colour of the photos
    - Ecological (interprets depth from light and shadow cues in real-life environments)
  - Perceptual theories
    - Semiotics (the study of signs and symbols and their interpretation – iconic, indexical, symbolic)
    - Cognitive (viewer sees object and arrives at conclusion about object via a mental process)

Genre analysis and visual communication studies

- Scientific conference papers (Rowley-Jolivet, 2002)
- Design studios (Dannels, 2005)
- Images in advertisements, websites, film, photograph (Schroeder in Belk, 2006)
- Digital libraries (Rauber, Muller-Kogler (2001)
- Powerpoint presentations (Bucher & Niemann, 2012; Hertz, van Woerkum, & Kerkhof, 2015)
- Newspaper homepages (Knox, 2007)
- Weblog (Miller & Shepherd, 2004)
- Posters (MacIntosh-Murray, 2007)

Research gaps

- Genre analysis has focused on mainly textual forms and various visual forms as listed above but not the table of contents
- Past studies using genre analysis have focused on analyzing the moves in engineering research articles and not moves in engineering final-year project reports

Aim

- The aim of this paper is to investigate the feasibility of using TOC as a tool to teach students the moves and steps in engineering reports by comparing the moves and steps in textual and TOC forms in terms of:
  - the generic structures of four engineering sub-disciplines
  - and the variations within and across the four sub-disciplines for the introduction, methods, results and discussion sections in the report

Significance of the study

- Implications to technical communication writing teachers
  - Facilitates understanding on how scientific discourse is crafted in a holistic rather than fragmented view of knowledge, and sensitivity to variations in rhetorical structure within sub-disciplines (identification of obligatory, compulsory or cyclical moves)
  - Develops students' academic writing competence and conformance to specific disciplinary expectations
- Implications to writing researchers in using genre analysis
  - More objective method to analyze macro-level discourse structure
  - Reduces reliance on subject-matter experts to conduct inter-coder analysis, therefore more accessible to non subject-matter researchers and students
- Implications to studies in visual communication
  - Facilitates the development of a coding scheme based on genre information to annotate macro-level discourse structure
  - Facilitates the automatic analysis of the structure of documents and integrates this information into an automatically created content-based organization (Rauber & Muller-Kogler, 2001)

Method

- Choice of research methodology – Swales' genre analysis using moves and steps. The frequency of the moves and steps could reflect the subdisciplinary variations quantitatively
- Choice of engineering subdiscipline - civil, software, biomedical and materials science engineering.
  - The first three subdisciplines were studied by Kanoksilapatham's (2015)
  - This study compares these three sub-disciplines with another subdiscipline i.e. materials science and engineering (MS).
  - MS chosen because it is interdisciplinary in nature and one of the broadest of study disciplines, incorporating chemistry, physics and engineering (Ferguson, n.d.)
- Choice of sample - First 60 final-year reports from the School of Materials Science and Engineering deposited in the library depository in 2015 regardless of type of report (may not be experimental reports)
- Study approved by Institutional Review Board

Coding procedures

- The TOCs were analyzed using Swales' genre analysis, following Kanoksilapatham (2015)
- In determining the generic structure in the TOC, the frequency of occurrence of each move and step was recorded – determines whether the move is obligatory (100% occurrence) or optional
  - A summation of the number of times a move occurred was calculated based on the total number of reports analyzed (e.g. 52/60)
  - A summation of the number of times a step occurred was calculated based on the total number of times a move occurred (e.g. 8/52)

Coding procedures

- In determining the variations in the subdisciplines, the frequencies of occurrence of each move and step were compared and contrasted
- An attempt was made to have subject-matter specialist counter-check coding
  - The expert perceived that there is too much diversity in engineering reports for there to be any emerging pattern in the analysis and found it sensitive to comment on colleagues' work
- Colleague counter-coded instead – 6 reports out of 60 reports (10%)

Limitations

- Differences in modality - Discourse analysis is textual while TOC is visual. A move or step might be present in the report but was not reflected in the TOC. No test of significance was conducted
- Differences in type and level of reports – Kanoksilapatham's (2012, 2015) reports are research articles randomly selected from the top five journals of the three subdisciplines. They are all experimental reports. In this study, the reports are final-year engineering reports taken from the institutional depository. 85% of the reports are experimental reports.
- The literature review section in the MS final-year reports were not analyzed as there was no basis for comparison in other research papers
- The reports were taken from only one institution of higher learning
- Thus, this study is exploratory in nature

Overview of results from TOC of MS reports

- Types of reports - Two modeling reports, seven simulation reports and 51 experimental reports
- TOCs are able to reveal approaches in writing engineering reports (linear or problem-based) promptly and holistically
- There was no distinct pattern that differentiated the three types of reports (experimental, modeling, or simulation reports) within the materials science and engineering subdiscipline
- The TOC reflected that some moves (m8, m9, m11) and steps were compulsory and some obligatory; some cyclical. Steps were not reflected in the results and conclusion sections

Overview of results among the four sub-disciplines

Move / Step	CE (%)	SE (%)	BE (%)	MS (%)
Move 1: Establishing a territory	100.00	100.00	100.00	86.67
Move 2: Establishing a niche	71.67	81.67	86.44	26.67
Move 3: Presenting the present study	100.00	100.00	100.00	93.33
Move 4: Describing procedure	100.00	100.00	100.00	95.00
Move 5: Featuring other methodological issues	37.5	43.75	50.94	61.67
Move 6: Reporting and consolidating findings	28.13	43.75	49.06	0.00
Move 7: Summarizing procedures	88.89	88.89	85.00	5.00
Move 8: Reporting results	100.00	100.00	100.00	100.00
Move 9: Commenting results	94.44	88.89	88.33	100.00
Move 10: Reviewing the present study	68.75	74.36	94.59	0.00
Move 11: Consolidating results	100.00	72.31	94.59	100.00
Move 12: Stating limitations and future research	68.75	84.62	73.38	80.00

- There seems to be more similarities in move frequency among CE, BE and SE textual analysis compared to MS TOC for the introduction, method, results and discussion sections
- The differences among the four sub-disciplines were more stark for moves 2 (in intro), 6 (in method), 7 (in results) and 10 (in conclusion) i.e. variations exist in all sections
- These differences might be due to a difference in modality which resulted in some moves and steps not being reflected in the TOC form

Findings for Introduction section

Move / Step	CE (N=60)	%	SE (N=60)	%	BE (N=59)	%	MS (N=60)	%
Move 1: Establishing a territory	**60/60**	**100.00**	**60/60**	**100.00**	**59/59**	**100.00**	**52/60**	**86.67**
S1: Claiming centrality	29/60	48.33	45/60	78.00	44/59	74.58	8/52	15.38
S2: Making topic generalization	58/60	96.67	57/60	98.00	58/59	98.31	51/52	98.08
S2.2 Elaboration on topic generalization							2/52	3.85
S3: Reviewing previous studies	56/60	93.33	44/60	73.33	58/59	98.31	2/52	3.85
Move 2: Establishing a niche	**43/60**	**71.67**	**49/60**	**81.67**	**51/59**	**86.44**	**16/60**	**26.67**
S1: Indicating gaps	37/43	86.05	45/49	91.84	39/51	76.47	1/16	6.25
S2: Adding to what is known	8/43	18.60	8/49	16.33	11/51	21.57	3/16	18.75
S3: Presenting positive justification	5/43	11.63	5/49	10.20	21/51	41.18	14/16	87.5
Move 3: Presenting the present study	**60/60**	**100.00**	**60/60**	**100.00**	**59/59**	**100.00**	**56/60**	**93.33**
S1: Announcing purposes	47/60	78.33	49/60	81.67	49/59	83.05	54/56	96.43
S2: Summarizing methods	40/60	66.67	55/60	91.67	47/59	79.67	0/56	0.00
S3: Announcing principal outcomes	27/60	45.00	50/60	83.33	27/59	45.76	0/56	0.00
S4: Claiming research values	23/60	38.33	44/60	73.33	16/59	27.12	50/56	89.29
S5: Outlining article structure	17/60	28.33	30/60	50.00	6/59	10.17	4/56	7.14
S6: Offering procedural justification	12/60	20.00	3/60	5.00	3/59	5.08	0/56	0.00
S7: Clarifying terms	0/60	0.00	6/60	10.00	1/59	1.69	0/56	0.00
S8: Describing study sites	9/60	15.00	0/60	0.00	0/59	0.00	0/56	0.00
S9: Suggesting further research	0/60	0.00	1/60	1.67	1/59	1.69	0/56	0.00

General comparison per move

Move / Step	CE (%)	SE (%)	BE (%)	MS (%)
Move 1: Establishing a territory	100.00	100.00	100.00	86.67
Move 2: Establishing a niche	71.67	81.67	86.44	26.67
Move 3: Presenting the present study	100.00	100.00	100.00	93.33

- Similarity - Moves 1 and 3 have the highest frequency while move 2 has the lowest frequency in MS TOC and CE, SE and BE reports, consistent with Kanoksilapatham's (2012, 2015) findings
- General difference - No move is obligatory (100%) in MS TOC
  - Move 1 - 7 experimental reports and 1 simulation report did not have move 1 as compared to CE, SE and BE reports where moves 1 and 3 are obligatory
  - Move 3 – was not reflected in four MS TOCs. One simulation and one experimental TOC did not have subheadings at all, one experimental TOC only reflected move 1 (had a very lengthy literature review section) while another experimental TOC combined the Introduction and Literature review sections so moves 2 and 3 were not reflected

Comparison across moves and steps

Move / Step	CE (%)	SE (%)	BE (%)	MS (%)
Move 1: Establishing a territory	100.00	100.00	100.00	86.67
S2: Making topic generalization (background)	96.67	98.00	98.31	98.08
S3: Reviewing previous studies	93.33	73.33	98.31	3.85
Move 2: Establishing a niche	71.67	81.67	86.44	26.67
S1: Indicating gaps	86.05	91.84	76.47	6.25
S3: Presenting positive justification (motivation)	11.63	10.20	41.18	87.5
Move 3: Presenting the present study	100.00	100.00	100.00	93.33
S1: Announcing purposes (objective)	78.33	81.67	83.05	96.43
S2: Summarizing methods	66.67	91.67	79.67	0.00
S3: Announcing principal outcomes	45.00	83.33	45.76	0.00
S4: Claiming research values (scope)	38.33	73.33	27.12	89.29

- Steps in Moves 1, 2 and 3 in MS TOC contrast that of CE, SE, and BE
- Move 1 – TOC in MS focused more on step 2. Textual analysis of CE, SE and BE focused on step 2 and step 3 (might be due to difference in modality).
- Move 2 - Move 2 step 3 had the highest frequency in the TOC in MS but move 2 step 1 had the highest frequency in textual analysis of CE, SE and BE. Motivation for the research is regarded as more important in MS than the research gap? Because MS is interdisciplinary?
- Move 3 – steps had the most difference
  - S1 in MS TOC highest compared to CE, SE and BE
  - S2 and S3 do not appear in MS reports unlike CE, SE and BE. MS seems to prefer to present information in each section at a time
  - S4 had a 15.96% higher frequency compared to SE, 60.96% higher than CE and 62.17% in BE – as it is interdisciplinary, clarification of terms may be emphasized
  - S5-S9 are not reflected in MS TOC although reflected 2-50% in CE, SE and BE

Findings for Method section

Move / Step	CE (N=32)	%	SE (N=16)	%	BE (N=53)	%	MS (N=60)	%
Move 4: Describing procedure	**32/32**	**100.00**	**16/16**	**100.00**	**53/53**	**100.00**	**57/60**	**95.00**
S1: Announcing objectives	23/32	71.88	9/16	56.25	43/53	81.13	3/57	5.26
S2: Specifying protocolized procedures	10/32	31.25	0/16	0.00	26/53	49.06	48/57	84.21
S3: Detailing procedures	32/32	100.00	16/16	100.00	53/53	100.00	30/57	52.63
S3.1 Elaboration							1/30	3.33
S4: Providing procedural background	0/32	0.00	4/16	25.00	27/53	50.94	1/57	1.75
S5: Justifying procedures	25/32	78.13	12/16	75.00	33/53	53.26	3/57	5.26
S6: Describing research sites	14/32	43.75	0/16	0.00	0/53	0.00	0/57	0.00
S7: Declaring ethical statements	0/32	0.00	0/16	0.00	14/53	26.42	0/57	0.00
Move 5: Featuring other methodological issues	**12/32**	**37.5**	**7/16**	**43.75**	**27/53**	**50.94**	**37/60**	**61.67**
S1: Describing materials and participants	11/12	91.67	7/7	100.00	22/27	81.48	25/37	67.57
S1.1: Elaboration of materials							4/37	10.81
S2: Setting apparatus	6/12	50.00	0/7	0.00	11/27	40.74	13/37	35.14
S3: Identifying data sources	4/12	33.33	1/7	14.29	11/27	40.74	14/37	37.84
S3.1: Elaboration							1/14	7.14
Move 6: Reporting and consolidating findings	**9/32**	**28.13**	**7/16**	**43.75**	**26/53**	**49.06**	**0/60**	**0.00**
S1: Stating findings	9/9	100.00	6/7	85.71	26/26	100.00	0	0.00
S2: Interpreting findings	3/9	33.33	1/7	14.29	2/26	7.69	0	0.00
S3: Comparing findings	4/9	44.44	2/7	28.57	2/26	7.69	0	0.00
S4: Explaining findings	3/9	33.33	1/7	14.29	1/26	3.85	0	0.00
Move 3 S7: Clarifying terms							2/60	3.33

General comparison

Move / Step	CE (%)	SE (%)	BE (%)	MS (%)
Move 4: Describing procedure	100.00	100.00	100.00	95.00
Move 5: Featuring other methodological issues	37.5	43.75	50.94	61.67
Move 6: Reporting and consolidating findings	28.13	43.75	49.06	0.00

- Similarity – Move 4 had the highest frequency compared to moves 5 and 6 for CE, SE and BE reports and MS TOC
- Difference – Move 4 is obligatory in CE, SE and BE reports but not in MS TOC. One modeling TOC did not breakdown into headings, one experimental and one simulation TOC went direct to move 5. Move 4 might be presented in move 5
- Difference – Move 5 is highest in MS TOC as compared to CE, SE and BE reports (different sample sizes)
- Difference – Move 6 not reflected in MS TOC compared to CE, SE and BE reports (might be due to difference in modality)
- Note: Moves in Method section still explained, rather than downgraded to end of paper as mentioned by Huckin (1987)

Comparison across moves and steps

Move / Step	CE (%)	SE (%)	BE (%)	MS (%)
Move 4: Describing procedure	100.00	100.00	100.00	95.00
S1: Announcing objectives	71.88	56.25	81.13	5.26
S2: Specifying protocolized procedures	31.25	0.00	49.06	84.21
S3: Detailing procedures	100.00	100.00	100.00	52.63
Move 5: Featuring other methodological issues	37.5	43.75	50.94	61.67
S1: Describing materials and participants	91.67	100.00	81.48	67.57
S2: Setting apparatus	50	0	40.74	35.14
S3: Identifying data sources	33.33	14.29	40.74	37.84
Move 6: Reporting and consolidating findings	28.13	43.75	49.06	0.00

- Move 4 – Step 1 is hardly mentioned in the MS TOC but quite frequent in the CE, SE and BE reports respectively
- Move 4 - Step 2 had the highest frequency in the MS TOC as compared to CE, SE and BE reports respectively
- Move 4 – Step 3 was conventional in TOC MS as compared to CE, SE and BE reports where it was obligatory. Note: Any subheading of step 2 was treated as step 3
- Move 5 - CE, SE and BE reports and MS TOCs are "means-focused" (Bruce, 2008). Fast/compressed discourse organizing pattern (Swales & Feak, 2000) for the physical sciences, focusing on the explanation cognitive genre (Bruce, 2008)
- Move 6 - is not reflected in MS TOC as compared to CE, SE and BE reports

Findings for Results section

Move / Step	CE (N=18)	%	SE (N=27)	%	BE (N=60)	%	MS (N=60)	%
Move 7: Summarizing procedures	**15/18**	**88.89**	**24/27**	**88.89**	**51/59**	**85.00**	**3/60**	**5.00**
S1: Briefing procedures	15/15	100.00	23/24	95.83	51/51	100.00	3/3	100.00
S1.1 Elaboration							1/3	33.33
S2: Justifying procedures	3/15	20.00	8/24	33.33	27/51	52.94	1/3	33.33
S3: Defining terms	3/15	20.00	1/24	4.17	4/51	7.84	0/3	0.00
S4: Referring to previous studies	10/15	66.67	6/24	25.00	14/51	27.45	0/3	0.00
Move 8: Reporting results	**18/18**	**100.00**	**27/27**	**100.00**	**60/60**	**100.00**	**60/60**	**100.00**
S1: Elaboration of results							22/60	36.67
Move 9: Commenting results	**17/18**	**94.44**	**24/27**	**88.89**	**53/60**	**88.33**	**60/60**	**100.00**
S1: Interpreting results	15/17	88.24	19/24	79.17	43/53	86.79	0/60	0.00
S2: Explaining results	10/17	58.82	17/24	70.83	35/53	66.04	0/60	0.00
S3: Comparing results	11/17	64.71	10/24	41.67	24/53	45.28	2/60	3.33
S4: Exemplifying results	3/17	17.65	3/24	12.5	3/53	5.66	1/60	1.67
S5: Cautioning limitations	2/17	11.76	4/24	16.67	8/53	15.09	1/60	1.67
S6: Summarizing results	2/17	11.76	5/24	20.83	7/53	13.21	5/60	8.33
S7: Directing future research	2/17	11.76	2/24	8.33	1/53	1.89	1/60	1.67

General comparison

Move / Step	CE (%)	SE (%)	BE (%)	MS (%)
Move 7: Summarizing procedures	88.89	88.89	85.00	5.00
Move 8: Reporting results	100.00	100.00	100.00	100.00
Move 9: Commenting results	94.44	88.89	88.33	100.00

- Similarity – Move 8 is obligatory for MS TOC and CE, SE and BE reports
- Differences
  - Move 7 is hardly seen in MS TOC (5%) as compared to n CE, SE and BE reports
  - Move 9 is obligatory for MS TOC but conventional for CE, SE and BE reports. Note: The steps in Move 9 is often not reflected in MS TOC

Comparison across moves and steps

Move / Step	CE (%)	SE (%)	BE (%)	MS (%)
Move 7: Summarizing procedures	88.89	88.89	85.00	5.00
S1: Briefing procedures	100.00	95.83	100.00	100.00
Move 8: Reporting results	100.00	100.00	100.00	100.00
S1: Elaboration of results				33.67
Move 9: Commenting results	94.44	88.89	88.33	100.00

- Move 7 – mostly focused on step 1 (briefing procedures) for MS TOC and CE, SE and BE reports
- Move 8 – obligatory for MS TOC and CE, SE and BE reports. 33.67% of MS TOC has subheadings for the different results. Steps for move 8 were not identified in Kanoksilapatham (2015)
- Move 9 – obligatory for MS TOC but conventional for CE, SE and BE reports. The steps in move 9 in the TOC could have been subsumed in the subheadings for the different results (refer to move 8)

Findings for Conclusion section

Move / Step	CE (N=16)	%	SE (N=39)	%	BE (N=37)	%	MS (N=60)	%
Move 10: Reviewing the present study	**11/16**	**68.75**	**29/39**	**74.36**	**53/37**	**94.59**	**0/60**	**0.00**
Move 11: Consolidating results	**16/16**	**100.00**	**36/39**	**72.31**	**35/37**	**94.59**	**60/60**	**100.00**
S1: Reporting results	16/16	100.00	31/36	86.11	35/35	100.00	0/60	0.00
S2: Explaining results	11/16	68.75	12/36	33.33	28/35	80.00	0/60	0.00
S3: Summarizing results	5/16	31.25	2/36	5.56	16/35	45.71	1/60	1.67
S4: Interpreting results	15/16	93.75	22/36	61.11	33/35	94.29	0/60	0.00
S5: Comparing results	10/16	62.50	2/36	5.56	25/35	71.42	0/60	0.00
S6: Exemplifying results	5/16	31.25	11/36	30.56	6/35	17.14	0/60	0.00
S7: Claiming values of results	4/16	25.00	11/36	30.56	15/35	42.86	0/60	0.00
Move 12: Stating limitations and future research	**11/16**	**68.75**	**33/39**	**84.62**	**29/37**	**73.38**	**48/60**	**80.00**
12.1 Elaboration							2/60	3.33

General comparison

Move / Step	CE (%)	SE (%)	BE (%)	MS (%)
Move 10: Reviewing the present study	68.75	74.36	94.59	0.00
Move 11: Consolidating results	100.00	72.31	94.59	100.00
S1: Reporting results	100.00	86.11	100.00	0.00
S2: Explaining results	68.75	33.33	80.00	0.00
S3: Summarizing results	31.25	5.56	45.71	1.67
S4: Interpreting results	93.75	61.11	94.29	0.00
S5: Comparing results	62.50	5.56	71.42	0.00
S6: Exemplifying results	31.25	30.56	17.14	0.00
S7: Claiming values of results	25.00	30.56	42.86	0.00
Move 12: Stating limitations and future research	68.75	84.62	73.38	80.00

- Similarity – Move 12 occurred frequently for MS TOC (80%) and CE(68.75%), SE (84.62%) and BE (73.38%) with no identified steps, similar to Kanoksilapatham's (2015) findings
- Differences
  - Move 10 is not reflected in the MS TOC but is conventional in CE, SE and BE reports –might be due to differences in modality
  - Move 11 is obligatory in MS TOC and CE but conventional in SE and BE. Steps in move 11 are usually not reflected in the MS TOC

Discussion

- Perceived benefits of using the TOC to teach students the moves and steps in engineering final-year reports:
  - TOCs aid a holistic understanding of how different sections in a report build on each other via headings and subheadings in a visual rather than textual manner
- The aim of this paper is to investigate the feasibility of using TOC as a tool to teach students the moves and steps in engineering final-year reports
- The moves and steps in the table of contents in 60 final-year MS reports were compared in terms of frequency with the discourse analysis on the moves and steps in CE, SE and BE research articles by Kanoksilapatham (2015) in terms of:
  - the generic structures of the four sub-disciplines
  - and the variations within and across the four sub-disciplines for the introduction, methods, results and discussion sections in the report

Discussion

- The findings show that there is a generic structure for the four sub-disciplines, most moving from the introduction to the method, results and conclusion sections sequentially
- In addition, within each sub-discipline, the frequencies of the moves or steps used in the introduction, method, results and conclusion sections are consistent – no 'outlier' in any section, be it in the textual or TOC form
- The findings also show that each subdiscipline is unique, having its own conventions and perspectives with differences in the frequency of the moves and steps used. Contrast Basturkmen (2012) – differences mainly in steps
  - The frequency differences among the four sub-disciplines were more stark for move 2 (in intro), move 6 (in method), move 7 (in results) and move 10 (in conclusion) i.e. variations exist in all sections
  - Frequency differences among the four sub-disciplines more stark for steps in move 3 and move 11
  - Limitation of results: might be due to differences in modality (textual and TOC) and no statistical test conducted
- The findings are exploratory until more research on moves and steps using TOCs is conducted on other engineering sub-disciplines

Implications

- Pedagogical implications
  - Moves and steps in TOCs could be used as a tool to help scaffold students' academic reading and writing, and oral presentations (viva assessment) as it identifies obligatory and conventional moves and steps in the subdiscipline. Bypasses text in the ideational stage
    - Efforts could be made by subject-matter experts to identify which moves and steps are obligatory or conventional, with the understanding that if the move or step is important, it should appear in the TOC
- Research implications
  - TOCs could be used as a more objective tool to help non-subject matter experts map the macro-structure of academic texts for discourse analysis, thus augmenting the reliability of studies using genre analysis

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