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รหัสโครงการ SUT2-203-40-12-16
มหาวิทยาลัยเทคโนโลยีสุรนารี

ได้รับทุนอุดหนุนการวิจัยจาก
มหาวิทยาลัยเทคโนโลยีสุรนารี

ผลงานวิจัยเป็นความรับผิดชอบของหัวหน้าโครงการวิจัยแต่เพียงผู้เดียว

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ผู้วิจัย

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สาขาวิชาภาษาอังกฤษ
สำนักวิชาเทคโนโลยีสังคม
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ได้รับทุนอุดหนุนการวิจัยจากมหาวิทยาลัยเทคโนโลยีสุรนารี ปีงบประมาณ พ.ศ. 2540

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สิงหาคม 2541

ABSTRACT

This project first investigated SUT chemical engineering undergraduate behaviour in relation to their English language textbooks. It was found that although students do in fact use these textbooks, they tend to read the examples and problems much more than they read the text. A likely reason for this was the relative difficulty of the text, and it was hypothesized that this difficulty might in part be caused by the presence of many more "text-structuring" words (as in Winter 1978) in the text than in the examples. Using a 3-million word corpus of basic engineering and chemical engineering textbooks used by SUT undergraduates, it was established that there are lexical differences between text and applications, but these were not describable in terms of "text-structuring" words. Finally, a list was produced of the 5000 most common words in engineering/chemical engineering textbooks was produced, and it was discovered that large parts of the SUT lexical syllabus are irrelevant to the needs of chemical engineering undergraduates.

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Introduction

The three objectives of this project were:

1. To establish students reading behaviour; do they read the applications (i.e. the examples and problems) more than the text proper? Do they read the text proper at all?

2. To establish whether the presence of more "text-structuring" words in the text might be a factor in its greater relative difficulty

3. To establish what words students need to know to study chemical engineering textbooks in English, and whether the current lexical syllabus was likely to meet these needs.

1. Reading behaviour

A questionnaire was prepared, based on two student focus groups and interviews with faculty in the engineering and chemical engineering departments. The questionnaire was translated and back-translated and discussed with the School Research Chair. It was administered to three classes of chemical engineering students, totalling 106 students.
The questionnaire was partly based on a 5-point Likert scale (the "S" items below) and partly on direct closed-ended questions ("Q" items) (see appendix 1.)

Findings/discussion:

1.1 Students do use their English language textbooks (hereafter referred to as SSETEs)

Q1) How many hours a week do you study English SSETEs?
zero: 0
1-3 hrs: 26
4-6 hrs: 29
6-8 hrs: 24
9+ hrs: 21

S1) "I need to study English SSETEs to pass courses at SUT"
Mean response: 3.84 (sd 1.03)
S2) "Thai textbooks are adequate for study purposes"
Mean response: 2.06 (sd 1.02)
S3) "As I study at a higher level, I need SSETEs more than previously"
Mean response: 4.71 (sd .83)

Table 1: Correlations between items concerning need for SSETEs

	S1	S2	S3
YEAR	.0261(+)	n/s	.0483(+)
S1	*******	.0171 (-)	.0000(+)
S2	*******	*******	.0021 (-)

We conclude that students do actually spend some time studying their SSETEs; they perceive both a necessity to use SSETEs, and also an inadequacy in Thai textbooks; and this perception grows as they progress through the university.

1.2. Students study the examples and problems

Q2) What proportion of the examples do you read?
57% all : 43% some: 0% none
Q3) Mark the sections of the book that you found useful.

Examples: 100% yes
S4) "The examples in the SSETEs help me to understand the subject matter "
Mean response: 4.64 (sd .81)

Q4) "What proportion of the problems do you read?"
4% all: 3% none: 93% some
Q5) Mark the sections of the book that you found useful.
Problems: 70%: yes 30%: no
S5) "The problems in the SSETEs help me to understand the subject matter."
Mean response: 3.94 (sd .1.05)

We conclude that students read most or all of the examples and find them very useful; and read some problems and find them useful.

1.3. Most students have difficulty in using the text to learn about the subject matter

S6) If I have a choice, I prefer to read new subject matter in Thai
Mean response: 3.68 (sd 1.19)
Q6) How do you read the textual material?
20% in detail : 76% superficially : 4% not at all
Q7) Mark the sections of the book that you found useful.
Text: 68% yes : 32% no
S7) "It is necessary to study the text in SSETEs to pass the courses at SUT"
Mean response: 3.63 (sd 1.03)
S8) The textual material in the SSETEs helps me to understand the subject matter
Mean response: 3.31 (sd .1.05)
There are correlations between nearly all these items, as shown in table 2 below.

Table 2: correlations concerned with attitudes to text

	Q6	Q7	S7	S8
S6	n/s	n/s	n/s	.0093 (-)
Q6	******	.0011 (+)	.0351 (+)	.0226 (+)
Q7		******	.0098 (+)	.0045 (+)
S7			******	.0000 (+)

S9) If I don't understand new material, I read the textual material to help
Mean response: 3.59 (sd 1)
S10) I can pass by studying lecture notes in Thai and the examples and problems in English
Mean response: 3.73 (sd 1.03)
S11) It is very difficult to understand the textual material if I haven't attended a lecture on the subject first
Mean response: 4.11 (sd .91)

These results indicate that students are not using the text to learn about new subject matter. Firstly, 76% say they read the text superficially. This is not an appropriate style of reading for studying new content, but more suitable for purposes like checking information, or locating specific formulations. Secondly there was only a 3.31 mean response to the statement about the text helping students to understand new material. This, in view of the "acquiescent response set" (de Vaus 1995:89), where "...some people agree with the statements regardless of their content.", is not much of an agreement at all.

1.4. Students use examples and problems more than textual material

The mean responses about the usefulness of text, examples and problems show clear differences:

Examples help: 4.64
Problems help: 3.94.
Text helps: 3.31

S12) "In the SSETES, it is generally easier to study the problems than the text."
Mean response: 4.07 (sd 1.13)

We conclude that students have a strong preference for the examples and problems rather than the text.

1.5 Two other factors

1.5.1 GPAX:

Students with higher GPAXs spend more time with their SSETEs, but that is the only thing we can say about them. These "cleverer" students are not reading the text more, or finding it more useful, or preferring it to the other parts.

1.5.2 Year:

The only factors which seem to be related to the year of study are those described in section 1.1, concerning attitude to SSETEs. But there is no apparent corresponding change in behaviour. Seniors, it seems, behave like junior students. Their education doesn't seem to change their behaviour.

1.6 Conclusions

Let us put the contents of SSETEs on a continuum. What's necessary, what's useful, what's accessible, and what's helpful to understanding are at the top; at the other end is what is difficult, unnecessary (avoidable!), and unhelpful. It seems fairly clear from this study that the examples in SSETEs are close to the top; that problems are somewhat lower down; and that text is much lower again. It is indeed questionable whether students are using the text to learn new subject matter.

2. Text-structuring words

2.1 Open/closed-system words

A distinction commonly made in linguistics is between open-system words and closed-system words. Closed-system words are relatively few in number and normally express relations between the much more numerous open-system words. The number of closed-system words does not increase except slowly and rarely; open-system words are added to all the time. Closed-system words are also commonly called grammatical words. They are of course much more complex to understand and learn than open-system words.
Winter (1978) proposed a class of words that although traditionally classified as open system, actually functioned much like closed system words in the way that they bound parts of the text together and depended for their interpretation on the context . These were later called "text-structuring" words (McCarthy 1987).

An example: Some people sympathised with him but I could not forgive his ***actions***.

There is no way to understand what the word in italics actually means, or refers to, without having read the surrounding sentences. Thus "actions" might be said to be performing a "connecting" or "replicating" function.

This class does not mean the class of adverbials commonly referred to as "inter-sentence connectors" (although these are of course closed-system); it means vocabulary items which perform a comparable function. A list is appended below (see appendix 6).

2.2 Text-structuring words, text and applications

As text in textbooks is usually more general in nature, contains much less mathematics, and is physically "longer" than applications, it seemed reasonable to suppose that it takes more linguistic "organising". The difficulties for the non-native reader in apprehending this organisation were presumed to be one factor in causing reading difficulty, and it was further presumed that text proper would contain more features showing this organisation - including "text-structuring" words - than applications. If this was the case, we might conclude that such text-structuring words would be a suitable teaching item when preparing our students to read academic textbooks, since reading text was shown in the first part of the study to present great difficulty to SUT students.

2.3 The scan

16 textbooks were scanned using OCR software. 5 of them were for engineering and 11 for chemical engineering (see appendix 3)

This gave us a corpus of 3 million words; 2 million in the chemical engineering corpus and 1 million in the basic engineering corpus.
This corpus was divided first into engineering and chemical engineering and then into text, examples and problems (the latter two being the "applications".) The vocabulary in each of these sections was then compared to find out whether the text-structuring words were a feature of the text rather than the applications.

Findings/discussion

The "text" - the explanatory material - of the engineering corpus was compared with the examples and then with the problems; the text of the chemical engineering corpus was treated similarly. Using "Wordsmith" software, lists of "keywords" - i.e. words which are significantly ($p<.01$) more frequent in one section than in another - were drawn up. (From now, "more frequent" means significantly more frequent.) The keywords which were on Winter's list of "text-structuring " words were singled out.

The table below shows, in the left hand column, the words from Winter's list which are keywords, and, in the succeeding four columns, comparisons (by ratio) of each word's frequency in 1. chemical engineering text vs. chemical engineering problems; 2. chemical engineering text vs. chemical engineering examples; 3. general engineering text vs. general engineering problems and 4. general engineering text vs. general engineering examples. If no ratio is shown (*), that indicates that there is no significant difference in frequency.

Table 3: relative frequency of keywords in text, as against problems and examples

keyword	chem. eng. text/problem	chem. eng. text/example	gen. eng. text/problem	gen. eng. text/example
1.different/ce	14:9	9:4	12:7	12:5
2. effect(s)	8:5	12:8	6:2	11:5
3. form(s)	12:5	10:6	12:3	9:6
4. means	4:2	4:2	4:1	4:2
5. method	12:7	7:4	5:1	5:1
6. particular	3:2	3:1	4:0	4:2
7. case(s)	14:6	14:10	13:3	*
8. change(s)	5:3	11:8	11:6	*
9. similar	5:2	5:3	3:0	*
10.states	3:0	3:1	4:0	*
11.way	3:1	3:2	*	4:2

12.action	*	2:1	3:1	*
13.common	4:0	4:0	*	*
14.depend(s	*	3:2	*	3:1
15.like	2:0	*	4:1	*
16.parallel	2:0	*	3:2	*
17.situation	2:0	2:1	*	*

There are thus only 17 of Winter's "text-structuring" words that appear significantly more in the text than in other parts of the books. Of these only 6 (items 1-6 above) appear more frequently in all types of text analysed (engineering and chemical engineering) than in applications. Items 7-12 occur more frequently in only three cases out of four; 13-17 in only two.
The other 80+ words on Winter's list either
1) are not key at all in text compared with applications; or
2) behave inconsistently - i.e. are keywords in text in some cases, in applications in other cases, and perhaps not frequent at all in others. (e.g. the word "constant" is significantly more frequent in chem. eng. problems than in text; it is also significantly more frequent in chem. eng. examples than text; but it is significantly more frequent in general engineering text than in gen. eng. problems, and is not significant at all in comparing gen. eng. examples with text.)
The hypothesis that these "text-structuring" words, as listed by Winter (1978) will be a significant feature of academic text (engineering and chemical engineering) as opposed to applications, is thus not upheld.
This of course is not the same as saying there is no lexical difference between text and applications; But these facts are not accounted for by Winter's list. The question of how to characterise text (vs. applications) will be the subject of further research.

3. A useful syllabus for SUT students

3.1 What words students need to know

Taking into account research described by Laufer (1997) I will be proceeding on the following assumptions;

- Mastery of lexis is an extremely important factor in reading ability.
- There is a "threshold" level of vocabulary knowledge. Below this level, learners cannot expect to be able to read L2 (the second language) in anything like the way they do the L1 (first language). Above this level, they are significantly more likely to be able to cope.
- A mastery of lexis is more likely to be a significant factor in improvement than a mastery of grammar. (see for example Ulijn & Strother 1990)

The chemical engineering corpus consists of just over 2 million running words (tokens), and something over 30000 different words (types). Of these 30+000, just over 5000 occur more than 20 times in the corpus. This is equivalent to appearing about once every 300 pages or more. The list appended here (appendix 2) consists of those 5000+ words, with the following adjustments.

1. Function words - closed-system words - have been omitted.
2. Many of the words here have been lemmatised. This means that the word "use" (the most common word on the list) has been merged with "used", "using", "useful", and "user" etc. The number of entries has in this way been reduced to 2640.
Lemmatisation is not an exact science. Usually, the first word (alphabetically) has been used as the headword below (thus "velocities" is an entry, although "velocity" is actually by far the more common form of the word in the corpus.)

In the light of the research it seems reasonable to say that a student with sight recognition of all the following words would be well equipped to read chemical engineering textbooks.

The list still needs refining to take account of polysemy, technical meaning etc.

3.2 The current lexical syllabus at SUT

In each of English 1,2,3 & 4 students are asked, as part of the CAI programme, to learn about 40 words per week. These words are taken from the texts that they read on the course. The total number of words they are asked to learn is 1620. (Appendix 4).
Note that these words, being from the texts used on the courses, and being content, open-system words; tell you a great deal about the subject matter of a text. One should thus be able to make some judgement about the relevance of the texts in use from the word list; these words tell you what the texts are about. It is not just a question of the relevance or otherwise of the lexical syllabus; it is a question of the relevance or otherwise of the texts themselves.
Of the 1620 words, 533 appear in the engineering corpus 10 times or more. Thus 1067 of these items occur less than (say) every 300 pages, i.e. 62% of the English vocabulary syllabus is extremely rare or non-existent in the engineering corpus
The proportion in the chemical engineering corpus is not much different; 638 of the items occur 20 times or more (i.e. every 300 pages or so), while 982 do not; i.e. 66% of the English vocabulary syllabus is rare or non-existent in the chemical engineering corpus.
If the chemical engineering corpus as a whole (not just the words occurring 20 times or more) is taken, then 1241 items of the English 1/2/3/4 lexis is found. This means that 603 (about 36%) of the English 1/2/3/4 lexical items occur between 1 and 20 times in a 2 million word corpus. In the engineering corpus, if all the corpus (not just the 10+ words) is included, 960 of the English 1/2/3/4 words appear. This means that 427 (about 26%) of the English 1/2/3/4 words appear between 1 and 10 times in a 1 million word corpus. This information is summarised in table 4 below.

Table 4: Occurrence of English 1/2/3/4 vocabulary in engineering/chemical engineering corpora

TOTAL NUMBER OF DIFFERENT WORDS IN ENGLISH 1/2/3/4 VOCABULARY SECTION: 1620
BE = BASIC ENGINEERING
CE = CHEMICAL ENGINEERING

	5000 MOST COMMON (*BE*)	5000 MOST COMMON (*CE*)	FULL CORPUS (*BE*)	FULL CORPUS (*CE*)
WORDS FROM ENGLISH 1/2/3/4 (1620)	533	638	960	1241
WORDS FROM ENGLISH 1/2/3/4 OCCURRING RARELY	N/A	N/A	427	603
WORDS FROM ENGLISH 1/2/3/4 ***NOT*** OCCURRING	1087	982	660	379

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APPENDIX 1: QUESTIONNAIRE

QUESTIONNAIRE
Analysis of the methods used by Suranaree University of Technology chemical engineering students to study their English language textbooks.

This questionnaire is in four parts, dealing with the following:
Part 1: respondent's personal details
Part 2: approaches to studying English language textbooks
Part 3: methods and problems in studying English language textbooks
Part 4: opinions about studying English language textbooks.

Part 1: personal details

Instructions: tick ( ) in the appropriate box.

Sex: male
female

Year of study: year 1
year 2
year 3
year 4

GPA (as of the 3rd term of academic year 2540)

_____

Part 2: approaches to studying English language textbooks

Instructions: most English language textbooks consist of a number of different parts, as follows:

explanatory material: this part explains the new subject matter in a chapter (usually to be found at the beginning of the chapter)

examples: this part contains examples of the new subject matter being studied

problems: this part contains problems to test your understanding of the new subject matter (usually to be found at the end of a chapter)

diagrams: this part consists of pictures, diagrams and charts to help make the subject matter clearer.

This questionnaire aims to establish to what extent and how students make use of these different parts.

Put a tick ( ) in the appropriate box.

1. On average, how many hours per week do you spend studying English language textbooks?

   I never study English language textbooks
   1-3 hours
   4-6 hours
   7-9 hours
   more than 9 hours

2. When reading English language textbooks, how much do you study the **explanatory material**?

   I read it in detail
   I read some of it
   I never read it

3. When reading English language textbooks, how much do you study the **examples**?

   I study them in detail
   I study some of the examples
   I never study the examples

4. When reading English language textbooks, how much do you study the **problems**?

   I do all the problems
   I do some of the problems
   I never do the problems

5. When reading English language textbooks, how much do you study the **diagrams**?

   I study all of them
   I study some of them
   I never study them

6. Which part of the English language textbooks do you find useful when studying? (You may tick any number of boxes)

   The **explanatory material**
   The **examples**
   The **problems**
   The **diagrams**

	Statement	1	2	3	4	5
1	The meaning of technical words presents a big difficulty for me when studying English textbooks.					
2	The **examples** in English textbooks help me to understand the subject.					
3	I would prefer to read the subject matter in Thai if I could.					
4	If I don't understand new subject matter, I read the **explanatory material** in the English textbooks to help my understanding					
5	I can pass the tests by studying only lecture notes in Thai and **problems** and **examples** from English textbooks					
6	In the English textbooks, it is generally easier to study the **problems** than the **explanatory material.**					
7	The **explanatory material** in English textbooks helps me to understand the subject.					
8	As I study at a higher level, I need to study English textbooks more than previously.					
9	The English in the **problems** is easier than the English in the **explanatory material**.					
10	Word meaning presents a bigger difficulty than grammar for me when I am studying English textbooks.					
11	I need to study English textbooks to pass courses at SUT.					
12	I have an good understanding of technical terms before I go to study the English textbooks.					
13	The **problems** in English textbooks help me to understand the subject.					
14	The Thai textbooks which are available are adequate for study purposes.					
15	It is very difficult to understand the **explanatory material** in the English textbooks if I have not already attended a lecture on that subject.					
16	It is necessary to study the **explanatory material** in English in order to pass the courses.					

APPENDIX 2: MOST COMMON WORDS IN THE CHEMICAL ENGINEERING CORPUS IN ORDER OF FREQUENCY

use temperature react heat liquid gas pressure equation flow rate solve process give produce value water system show vapor time transfer operate twice air point mix constant energy concentrate mass example calculate material control change solid unit make high surface fluid number follow phase between form require velocities same relate line chemical result state cost assume large balance differ total low equilibrium case condition volume percent figure problem coefficient first data mole design function steam obtain varied find feed method increase determine tube small type dry effect contain section separate tank component usual conversion consider table area composition curve plant see fraction ratio take specify simple know properties amount work estimate order acid diameter pipe became factor express variable ideal particle represent evaporate pure develop reduce pump plate stream catalysis chapter size equal column drop measurable base leave enthalpies law enter tower terms equipment step force great occur applied compress importance average tray set cool necessarily power part initial stage need provide integral quantitative saturated continuous molecular crystalline similar absorb good boil species diffuse complete describe end three you write computation availability viscose resist second density less efficiencies limit solvent capacities call wall pass remove free define year possibilities range plot packed carry weighing here discuss condense correspond adsorbed involve oil side experiment zero bed distillate industrial depend engineer common direct filter compare approximate extract present model analyses yield new general final exchange steadily lose close loop place standard theoretical combination dimension well distribute bottom basis length film often treat layer flux contact manufacture single do does maximum minimum overall invest discharge substitute move either particular parameter diagram long carbon partial thick add indicate natural desired term actual decrease cylinder derive include solute open construct application act substance choice fix period boundary adiabatic note humid thermal top wet independent valve cause compound cross sulfur moist output evaluate illustrate molar characteristic wide way content level response interest procedure fuel differential lead introduce direction space expand turbulence let correlated exist proportion useful turbine bubble cycle metal remain return consequence mean presence element vessel input select hydrogen bar linear approach mechanical batch reach typical benzene information isotherm consist maintain means recover solubilities entire reverse frequencies region capital divide physical effective pound exit series steel dryer start still locate behave predict sodium essential hand addition inlet speed inside replace special degree reflux screen always cell correct account get nearer source shell straight purpose internal down gradient mol radiation easier rapid interface atmosphere drive generally difficult along critical allow distance equivalent keep excess vertical device further studied error normal rise supply test streams wash hot sphere glass entropy ordinarily practical respective refer settle body kinetic neglect done potential net real list situation cake preparation scale go group additional dilute consume friction agitated draw impeller original clear detail height charge employ considerable ammonia shape filtrate fall sample sufficient outside significance formation head oxygen convenience alcohol reynolds uniform surrounded slope definition grow positive horizontal annual permissible accuracy handle centrifugal connected perform optimum profile right zone four sometimes complex installation next individual answer nitrogen fast fiber light salt qualitative slurries main major bulk appear due heavier like transport atm bulb true sheet liquor momentum reference basic few generated gravity vacuum analogies alternative coal respect binary numerical activity diffusivity membrane polymer fine last organic hour gain outlet variation burn enough slow combustion began motion practice arranged tax negligible convection principle btu fed short service back chloride run strong commercial dioxide eliminate instead profit almost synthesis program thermodynamic far read rotate achieve suspended bring meter path appropriate mechanism square laminar piston sum condensation engine least local dynamic countercurrent current except life manner raw interact coordinate extend fact intermediate alumina rule probability stability furnace disperse parallel recycle conducted constituent technique machine come consideration fill depreciation external waste primarily report build little reasonable volatile acetone position toluene absolute slight oxide day negative spray transform previous question turn full again classification paper exposed residual rubber conveyed ethylene medium oils together formula resin multiple safe company continue cent dried iron plastic affect circulated especially field prevent concern drum mathematical plane root shaft fugacities once tend unknown establish porosity hold nozzle load cash effluent objective expect improve proper repeat course empirical cold third chlorinated flash chart crushed key manipulated insulated modify cover color late min methanol portion hydrocarbon removal suitable apparatus book throughout methane axes drier conductivities chain storage angle blade labor volumetric center taking multiplication support advantage graphical project rotary appendix criteria simultaneous structural concept half petroleum accomplish reason stoichiometric expense feedback re break chamber dissolved economic elevated proceed roll unity ring proposed agent food orifice understand upper baffle readily condensate sulfate identification stirred ethanol aqueous associated satisfactory extent flat infinite strength thin accumulate deviation earlier latent ability influence summary etc mixer ion pore double preceding explosion statement blow sugar extensive principal check put somewhat stripped calcium face look radius identical suggest clean electrical had block income irreversibilit+ forward silica soap intersect latter suppose kilogram oxidation dependence disturbance say site subscript valid fit magnitude rough rearrange decompose examine exhaust appreciable atom deliver expensive demand magnesia observe exactly exceed mill satisfied discrete fire fresh leaching matter mesh regenerated cut lie nucleus overhead newton's pellet digital sequence symbol plug analyze consistency applicable past configuration permeability precipitate pulp reboiler class index notice soda utilization word exact success gibbs kind price raise dissolve entrance insoluble unsteady wood eddy explain five receive stationary tubular dead desirable disk sieve signal activated reservoir toward cubic refined decay market setting stress careful ultimate dew finite hole smooth copper meet piece denote dependent grinders retain inert collect designate fractionated release substantial superheat upward distinct perfect restricted circle bond differentiate encountered moderate overflow serve corrosion sludge adequate melt radial recent refrigeration complicated whereas fitting hard salts tie ton subject active channel powder clay potassium purchase precise apparent definite laboratory reciprocal recommended accelerate black deal flooding fundamental non electric cellulose decision depth extremely alkali phosphate world idea phosphoric trial azeotrope gasoline outer propane brick facilities lime pollutants protect virial weir agree avoid six terminal acceptable alone butane immediate acetate determination fermentation homogeneous old shear sign ball mills sensitive mercury adjust belt deposit entrained generalized jacket hazard minimize rest displaced impure literature conclude feature item motor multicomponent paint blend cooler interval save selling static text feet inner inverse cascade caustic laplace log methyl name silver held jet minute carbonate drain ground store view whole environment fairly future instrument pattern recall tension analytical cheap crude attempt foot nonlinear sand worth perforated pigment subsequent granular instance ore cracked drag ethane foregoing insert isentropic scheme suction wire axial hydroxide preliminary record acetic constraint ethyl rich sale coating downstream downward edge opposite outline statistical geometric mention rare refractories coarse million obvious quick adaptation cap exhibit offer raffinate casing absence adsorbate ash code help toxic ceramic continuity never preferable superficial ordinate prandtl sensible exert room furthermore radiant research tracer valuable algorithm coil gross incompressible increment macroscopic nonideal want arbitrary fertilizer flue module publication rod sketch van withdrawn cast coke core exothermic holdup modern travel bearing grade oxidized poor reader undergo imaginary nitric phenomena box cement contribute secondary seem stack emission enriched nitrate pay random seal emulsion schematic stainless animal arise attention batteries discount inch partly utilities anhydride flowsheet grain leak observation residence shift automatic experience iteration perhaps regulation conventional dust enzyme excellent float impossible molal tangent unchanged american brine row starch stated dashed rejected rock fan occupied pitch plan schedule underflow venturi attached composed fluidized implied rectangular wax aid alloy frame joint logarithmic own transmission bowl closely rewrite void hydrate nucleation said sent sharp tar accept ammonium aromatic economical finished gradual

neither undesirable ambient propylene refrigerant split white gel ignore monomer nor categories demonstrate led strategies accompanied central cloth electricity instant kiln money pole recirculated rectification coolant disadvantage event former mold passage pipeline supersaturatio+ unstable detergent fabricated hypothesis injected mother origin sole think allowable business counter elementary transition analog country diaphragm downcomer gauge manometer object package spread stagnant sudden article brief conservation generate matrix molten prove reflect serious unique welded circumstances create emphasis federal flame perpendicular pulse slot basket carnot flange human insurance isomer phenol submerged wave hexane mounted recognize rigid styrene asset contaminant electrolyte handbook intensive mineral polynomial scrubbed thorough upstream wavelength zinc competing cone exponent hydraulic neutral otherwise science wilson fashion fruit person regulate remark station tabulated triangle deep journal offset possess realizable slab software stop arithmetic coils coupled earth ensure gram henry's stock voltage arrive currently disappearance effort ice spent sulfide technical bath drug liter paragraph remainder disposal earnings indeed periodic propeller subtract graph happen inorganic interpretation learn limitations minus pan silicon virtually adjacent annular ask desorption naoh bucket caps regular york attraction corn denominator dense floor heptane nickel octane sound attained auxiliaries economically impact page presents throat abscissa advanced arbitrarily chemistry ease electrode limestone notation salvage seed stroke discovered ether flexibility freezing glycerin historical land pair permanent raoult's review substrate theorem equimolar evolved extreme hundred machinery nominal pilot regard stand variance barium deposition failure magma multistage noncondensable owing pharmaceutical red reliable technology throttle weak droplets glucose milk namely trough wafer alkyl amplitude dollar eventually locus oven try coat hollow hydrogenation interpolation mechanics scope themselves thereby uranium algebraic branch cotton empty esters fund heterogeneous indirect intense screw uncertain vector additive capable gear odor osmosis really tool alternate barometer care compartment conditioning corrosive duct economy fluctuations lake oscillating picture radical rated soil stem unsaturated cyclone did ignition immersed interior likely lives metallic monoxide nusselt photographic raschig reuse warm xylene convergence fourth isobutane joined kettle leached margules omitted pairs prevailing prob soon thousand triple capitalized emissivity familiar frictional health ideality pentane polar severe thermometer today tuning electron justified lithium lump middle alter bacteria enclosed extra fines instantaneous murphree protein trace vegetable customary disc exception flavor government ingredient intercept liquefaction minor nothing optimization saddles steep bleaching cumene escape flowchart glycol lift mind nonisothermal risk sort trap via appearance bernoulli der fabric feasible fluidization guess interracial kerosene pastes penetration preheated softened textile acetylene assembly collision dropped fouling hydrolysis miscibility rankine skin tall vinyl age claimed hydrochloric marked month national prior sulfite wish allowance compensate economics green isolated lewis petrochemical reagent seawater seldom spiral tubing breakthrough intermolecular logic member moreover naphthalene narrow public thiele unreacted whenever bode butyl dissipation draft occasionally roller streamline subjected successive sure universal vanes adhesives bank chance coalesce concrete equipped feel gave graphic lag paraffin role beet downspout exponential formaldehyde fusion immiscible kwong microorganisms peripheral spring sucrose urea vent vortex bromine chloroform closer delay diffusional ejector endothermic fin platinum polymath popular ready schmidt segment skill soft startup annulus anode apart century circuit damage everywhere identity nyquist patent perfume policies proof regardless sensor solar tree unfortunately blue certainly contrast emitted intake seconds sink strictly winter beer casting chlorobenzene flammable inflation outward remember trend war wastewater amine butadiene colloidal conical currents ever filament guide nutrient overcome play potash segregation sewage spinning ahead cathode dab discarded foam frictionless layout leg margin perry reserve sense termed wheel yellow capillary character chief clearance cooking decide domestic elaborate envelope explicit house meal partition shipped vehicle workers yeast board cane car confidence cumulative favorable lubricant management mostly ozone paid quartz strike suited adjustable inversion investigation letting mach optimal rotor shock thermocouple trade usage admitted aim date incoming metric mode reforming round tunnel annuity antoine attack carbide chips duty evident extruded fins graphite gum inferential invention lack leather mpa nonvolatile numerous shut strain summer supercritical ten accordance bone cars cocurrent contraction costly declining diagonal ethylbenzene favor invariant leaf mining overdamped peak pick pool regression specialized superior tetrachloride tight unnecessary aniline aspects automobile biological bit bound cavity conduit diesel fission focus goal opposed population pyridine supersaturated wear abrasion arc electrostatic europe fish front horsepower nth olefins reasoning scrap verify counterflow doing enormous equating fourier's inherent juice majority modulus pneumatic river seven syrup viewpoint wind cat cation deactivation elemental hardware home kelvin kinematic porcelain printing purge search semibatch settler summation confined crossflow daily electromagneti+ fair fused graphs hammer helpful image inclined joule maximize miscellaneous mist penicillin polyvinyl rayon realistic revolving ribbon stokes titanium bundle cancel charcoal constantly datum english ill infinity inspection interchange intimate job memory noise nylon scraper tear ternary thrust transient trucks underdamped unusual volute acetaldehyde array bell borax curvature degradation dehydration devoted firm halide helium media nitration numerator parentheses psychrometric rigorous routine sedimentation sherwood simulation stuffing subcooled task unimportant virtue wool bypass chrome colburn dumped electronic ester furnish mild oversize peclet people plain poiseuille polyethylene presentation sea slip straightforwar+ thumb torque turpentine withstand adds caught composite convention coverage departure examination fluorine impulse incorrect induced ketone langmuir metallurgical mined mixedness particulate personnel presently progress rpm something stoneware tensor ago arguments attachments believed berl chromium continually domain electrolysis evidence fur hint integer inventory likewise nonporous opaque pertinent presumed randall shale sinusoidal sulfonation superscript things thrown trioxide vat vice wells angular art asymmetric bag broad bromide came cents ci corporation cottonseed dehumidificati+ dipole extrapolation fahrenheit flakes gc gelatin hill instrumentatio+ jaw legal moment organization percolation ports soybean stone trans underground university whereupon accord argon backward besides bottle chest cited confusion contacts devised dewpoint else elsewhere en entry facilitate foreign gate gold incomplete institute international issues knife latex longitudinal ls mesitylene microscopic municipal nomenclature payout portland rework sublayer supervision taste taylor tumbling versa agricultural authors bicarbonate binding buffer concave concentric const coon crossover danger depicted diverging dolomite eight evacuated evolution false feedwater formal forth fructose hydrodynamic incident insufficient intended loose pseudo repairs revolution slit spectrum subsystems tail unmeasured accommodate antibiotics assist beans boltzmann breakpoint brown bubblepoint butene ferrous fictitious gray hagen iodine kraft labeled loc makeup mccabe miscellaneous nonflow noninteracting orsat physics professional progressively pulley roof shrinkage summing supersonic varnishes version weather aliphatic attrition centipoises conjunction cyclohexane depletion dirt everything exercise fick's filler froth gallons gi goods governed hydrodealkylat+ implicit inexpensive inward lignin man military naphtha obsolete pinch plunger polyester pulverized rosin rotameter shallow spite sun systematic taps tedious transparent unwanted visible accident analytic arms asphalt assigned background bounded breakage celsius chiefly classical coking combustible compensator curing damped dimethyl finned generalization glycerol imposed insects isopropyl ith lard liberated modest multipass neutrons nichols nu objectionable optical pine pitot polished promising quantum quarter redundant reflex relevant shutdown sight style subsonic superphosphate temporary tire tnt vitamins wine wrong yarn accessible adhering anion artificial bauxite bin brass calcined california coffee coincide contrary cyanide dehydrogenatio+ destroyed disulfide enamel ferric flights furfural gasification hydrostatic infinitesimal insecticides intalox intermittent interphase isotopes methodology modular nacl nitrocellulose nonpolar pot prime pvt south survey switch truncated vital vol accordingly adopted airstream app attain basin bends brackets compact count enclosure esterification eye fastened fortunately fossil grashof hardening household inequality necessity neighborhood office options organisms pisat posed priming resembles rocket sluggish society stagewise sticky supplementary surfactants tough ultraviolet unaffected unbound usp vb wick window bare

APPENDIX 3: BOOK LIST

Engineering

Cengel Y.A. & Boles M. (1994): Thermodynamics: an engineering approach (McGraw-Hill)
Craig, Roy R. Jr., (1996): Mechanics of materials (Wiley)
Montgomery D. & Runger G. (199x): Applied statistics and probability for engineers (Wiley)
Beer F. & Johnson E.R. (1990): Vector mechanics for engineers (McGraw-Hill)
Gerhart P., Gross R. & Hochstein J. (1993): Fundamentals of fluid mechanics (Addison Wesley)

Chemical Engineering

Badger W. & Banchero J. (1955): Introduction to chemical engineering (McGraw-Hill)
Austin (1963): Shreve's chemical process industries (5th ed.) (McGraw-Hill)
Winnick J. (1997): Chemical engineering thermodynamics (John Wiley)
Levenspiel Octave (1972): Chemical reaction engineering (John Wiley)
Himmelblau D.M. (1989): Basic principles and calculations in chemical engineering (Prentice Hall)
Fogler H.S. (1986): Elements of chemical reaction engineering (Prentice Hall)
Stephanopoulos G. (1984): Introduction to chemical process control (Prentice Hall)
Smith J.M., Van Ness H.C. & Abbott M.M. (1996): Introduction to chemical engineering thermodynamics: 5th ed. (McGraw Hill)
McCabe W., Smith J.C. & Harriott P. (1993): Unit operations of chemical engineering (McGraw-Hill)
Bird R., Stewart W. & Lightfoot E. (1960): Transport phenomena (Wiley)
Peters, Timmerhaus (1990) : Plant design and economics for chemical engineers (McGraw-Hill)
Treybal E. (1988): Mass-transfer operations (McGraw-Hill)

APPENDIX 4: THE SUT LEXICAL SYLLABUS

absence accompanying alternative apparent apply aspects audio by-product cables communicated convert cope corporations degradation device digit displaying distinguish doubt electronic embraces enable ensure error eventually fiber frequency generations handle identical incorporate integrated intend justify link location magnetized means measure medium message microchips modem modulated offer optical original oscillations previously production pulse quartz receiver referred replace representing result revolution scale scrambled separate signal speech spurred steady support telecommunications traditional transmitting ubiquitous universe variety vanous wire worthless abruptness additive affluence appendix aromatic avert balanced blurb boom bottleneck bounty chewed collaborated combined consumes consumption crisis criticised current damage declined deliberate diet disinfection distribution doses drag evaporation evidence exceeded exception exhausted expansion expectancy expert extract fertiliser fibers floods frontier grain booked ideal increased index infinite irrigated isolated limits malnutrition massive measures mismanagement mix notice output palate capita pesticides photosynthesis planet plots productivity projected prolonged proof prototype radical reap recommended rehabilitation relevant responsible reversed shortages significance source spreading squeezed starvation strain stumbled surpassed trends unprecedented verbal wasteful withstand aerobic aggregates aid anatomies ancestry ancient apparatus appearance appendages atom attributed barren blocks classifications complex composed condensed conduits consists contents contributions conversely coral cubicles curiosity cytoplasm depend detect diameter dilute discharge diversity drastic elaborate embedded encase enlarge exotic exotic extensions extensions fame features fluid formulation furnished generalizations genetic hostile identify indivisible inhabits instructions invariably inventor line locomotion mammalian mass matter membrane metabolic microbes microscopic monastery morphological neatly nerve nourishment parade passage perception present previously projections proposed protect receives recognized reefs registered replication reproduction reproductive resistant rigid serve sewage specialized sponge spontaneous spores stated stimulated structure synthesis teeming temperate thrive tiny tissue transiently transmit ultimate upset vanish vastly wealth wiped yolk according affiliations antagonisms application appointment astonishing beneficial boards breakthroughs brewing chopping commentary commercialize confidently consensus consideration consistency consultancies corporations cripples cultured deciphered destiny detached distort disturbing emphasize engaged enquiry enterprise ethical fertilization flocked frowned fundamentally furious hailed haste heightens impact implications infertile informative injectable literally observer organ paler peculiar positions primarily proportions prospect rapidly regulate revolution snobbish spirit stake stunning subsequent substantive supervises therapy thoughtless traditionally transform transitory triumph uniqueness untenable utility vagaries variation venture visibility ability achievement aircraft ambition ancient application artificial assignment branch breakthrough capability career chemicals civilized coincided colleagues combustion community concentrate concrete confused consider construction contributions curiosity demonstrate design determine disregard doubt efficient electricity essential ethics examine existence firms formalized founding gradual hobbies illustrate impressive inevitably influenced ingenuity institution inventions legal license manufacture mastery mean numerous obviously outnumber persevere personnel perspective pioneers potential principles profession remarkable require respect review significant sophisticated sufficiently technical utilize visualize vocation witnessed affected alterations aridity barrier captivity channel colonize combination compressed conceived contaminants contribute convert curious decision destructive devour discourage dispersed divert domesticated drainage dunes economically ecosystem elements enclosure evolved excavate extinct extremely forage glacial hazards herbs horns immigration incidentally initiate intended irrigation management mentioned modifications orderly original patches pave period pests pioneer potentially predation prescriptions presence primary readily rear recognition regularly reluctant revenue salinity scarce seedlings severely shrubs sows substitutes Succession superseded swamp tend threatened vegetation vulnerable accounted administration aristocrat assign awarded biassed bureaucrats channelled collapse commerce commit confined conflicting consultants contractor court decline defence descendants district dominance edible enterprise era ethos exclude exploitation foreman fused generate govern grazing grievances ideal immediately immigrant income influences intact kinsfolk law literate livestock migration mould multiply NGO owning passage pervaded petitioned politics premium property protested qualified ranks rape reinforce reserved resistance responsible revolved secluded seize shares shelters strategy strike subsidiary threatened unaffected unreliable value wheeled accessible adhered adjustment aerial alignment analogous4 appliances appreciate1 approval archives assemble assumption awry bizarre burst ceiling chatter collaborations colleagues confident confined credit currency dangling deduce delays democratic dip disabilities displays don dough dropout dubbed eagerly embed enable entrepreneur extravagant faint flaws folks fumbling gestures gigantic grunts hideaways hulking illusion imbuing immense inauspiciously injuries interference interpretive intuitively invisible laundry linear midair museum navigate nonverbal notion perspective piqued plunging pose premier privilege publishing pulse queuing readership restrict rigid sacred shielded sifts sneakers spark spawned stacks striking strip stuffed subscriptions supplement surf swings tinny trademark twisted unobtrusively vies violently virtually wafer whiz wiggles abrasiveness abundant accentuated adequate agile alchemists alert alloys animate array articulated atmosphere attenuate autopsies breakthrough brute buoyant capabilities column compensate competitive compressive consolidated contingencies corrosion crucial crystalline cue customization defects deposit devices dissolve durable emanates enlist essence far-fetched fatigue friction frigid fused futuristic gracefully grasp hierarchical inorganic insoluble insulators intricacy linings magnate marine matrix metallic mimic muscles obnoxious observed obtain orderly outstanding patch personalized poised potent predominant primarily propulsion prospective rapid recover reflex replace replicate resin resonate retirement reveal revert seal sensation sensors severe sonar specifications standardized stiffen stove strain suite tactile thermally toll tumble unprecedented upsurge utilizes vibrations welding aberrant accelerated acquired amenable anesthesia aspec attack augment bacterial ballistic bombarded bottleneck cereal chronic clone cluster commercial compartmentalized confer defective defenses derive devastating disorder donated dose elasticity elusive employs evidence facilitate feasible fertile flax flick fragments fundamentally fungal hybrid impairment imperfection inflamed inherent inhibit innovative insights intrinsically juncture marginal mustard mutation notwithstanding novel nutrients occasional ornamental pathogen permanently pigmentation progeny projection promoting propagated reaction recalcitrant recombinant regeneration regulatory responsive revolutionize ripening scourge selectively sensitive sequence shelf-life softening spectrum straightforward subtle surgical susceptibility switch tinkering tolerance traits transfusion transient transmit trial unique utility viable vine volunteers weed wounded nauseam additive adjacent adverse aesthetically alleviate ascend assimilated authorities beverages billboard biomass campaign capture chamber cleansing cooperate combustible compatible: consist constituents constraints consume consumption convenient core cumulative current debris deleterious devise devote dirt discharge discipline drainage drawbacks dweller emit encapsulate equilibrium evolve expended fashioned flourish framework frescoes gravel host incinerate induced inert innocuous invention launch liabilities malfunction mantle metamorphosis mitigate molten odoriferous offend onslaught outline overreact overdue particle plague prelude prerequisite priority protect rampant rarefied release remarkable remind reserve reservoir residue scheme shortage shrouded slag socioeconomic sophisticated stagnant sustain tap thrive thrust toxic tremendous unsightly versatile volatile withdrawn withstood wrap acclaimed acute anecdotal ant arable arid camel charcoal deteriorated disequilibrium drylands dynamics encompass environs exacerbated fauna fertility flora fluctuations fodder germination granaries grazing humid incentives inequitable infiltration insidious intensity intercept interrelation invalid jettisoned lethal lightning mainstream massive mistreatment mobilization nomadic outbreak outward pasture perimeter pervasive pristine proximity pulverizes reassessment recovery reinforcing relief resilient respectively sapling scant severity soaring spatial sporadic struggle temporal terraces tillage tolerate topographical transition treaty ubiquitous worsening abundance accretion binary bombardment calculate chaotic

coincidence collisions consequence constellation constraints correlation critical density disrupted elaborate embedded emerged equator evolution existed fragment gravity hyperactive implying indicate inevitable intimately magnetic merely mystery orbits peculiar predict prevalent radius reasonable reflect remnant rotating scatter shifts stability stellar surfaces symmetric terrestrial transmitted velocity visible information attention announce competition expense institute introduction conclusion comment opinion logical perfect originality imagination potential improve citizen judge scholarship comprehensive include intensive conversation award publish neatly employee eligible guardian guarantor decision secure effort reject application provide decade advantage proficiency associate appropriate confidence pressure motivation performance practice trimester session requirement bachelor's succeeding consist duration exclusive enrolment curriculum fulfill correspond standard prescribe undergraduate satisfactory completion minimum duly primary component responsible disciplines unique conduct degraded occupy incorporate variety site exhibition display facilities academies industrial aspects breed opportunities process harvest poultry evident participate alleviate increase. supplies hazard threaten claim document activists pungent diligent suffer severe convulsion inflammation enclose miscarriage migraine waste discharge garbage fluorescent lubricant contents discarded trash drowsiness disorders fatal disposal addict. narcotics retailers penalty approve currently control transfer manufacturers distributors imprisonment a fine radiation far-reaching spread reservoir runoff. deposits. silt infiltrate indiscriminate predator pest. applications desertification overgraze livestock overcultivation deforestation improper irrigation cattle estimate slight moderate sustain existence prospect imminent starvation contaminate ecosystem toxic ingest concentration accumulation reduce significantly impact generate renewable emit greenhouse accomplish recreational subsistence plough transplant gradually sowing tilling reaping. typical shifting cultivation exhausted yields famine invasion antibiotics enzymes amino acids artificial insemination embryo hybridisation immense challenge. adopt slaughter pesticide raise additives assurance equipment cash population concern organisms value possibilities organs germinate dormant structure substance obtain offspring unfertilized vertebrates reproduction partial contain obvious infect require isolate slice derive disadvantage identical variation asexually permanent split separate fragmentation alternation dominant sexually maintain temporary individual surface detach primitive shuffle compress solid narrow reactor fission release increase decrease moderator produce catastrophe power station radioactive probable official incident improve warning original fuel common fragment gain chain take place quantity tube cylinder absorb fluid core coolant shield prevent escape properties mixture saturated settle dispersed suspension emulsion pure impure impurities particles vibrate direction layer droplet distilled melting point synthesis. precipitation conduct deposits manufacture consumption. essential constant condition surroundings quantify telecommunications methods satellites revolution provide device tremendous enable specific reference purpose profound diagnose potential generation transmit depend instruction accept input classify available privacy risk accessible psychologist detect fundamental innumerable context agility exposure literate intellectual integrated incorporation animation advance violate promising beneficial unauthorized consumers protection prophesy tool wisdom incur limited alternative monetary hidden implied vacant warehouse income savings derive average accounting records illustration forgo neglect influence assume foreign exchange totaled competition managing director disaster damage prompt global interest charge period accumulated remaining compound interest owed loan graduate accomplish accumulate accurately advantage apparently application aspects assistance benefit calculations capabilities classified concentrates diverse efficient emphasize enormous essential! establish exploration explosively extremely implies impressive innovation interpret invention. limited literacy means movable offer operate permanent potential purchase recent significance supervise widespread administer attack categorize containing demolishes demonstration diminishing disappear discovery dissecting effects fatigue genetically gradually harvest hypothesis instruments kingdoms mode mystery observation occurred organisms phenomena prediction preventing primitive. provide retaining retreat severe spectacular stimulate stress subtle symptoms transfer transmit acutely additive additional advanced associated assure attention considerably consumers cultivation decaying decomposed depend disaster efficiency emerge implements improve inhibits insecticide investigate irrigate located major manual nourishment obtain pesticides pests possible prepare realized replaced separate shortage subsistence sufficient supply surpluses yields group herbicide include independently instrument involuntary magnification measure mixture objects phenomenon planets pond prevent protect pump random regio substance tiny arrange attach attempt classify constructed crossbreeding dedicated deleting derive diffusio dispersion dye ecosystem enlarge exhibit familiar features fertilize focus irrigation limbs mining operas optimal ore plethora preparation primary principles recent removal restrict revolutionized sanitary split undertake urban variety ancient artificial automobile complex. concerned disciplines discovery distinct eliminate equipment vehicles expand extraction facilities feats handicapped. harness huge infrastructure involve range absorb ample assemble attraction bachelors bleach blockage capacity curb deforestation dewater disregard due flimsy. frame inadequate injected install intense massive overflow poisonous predictable prestige private promote remaining remove scant screen seedlings sift out slurry spinning struggle surround undernutrition weeds whiten wrinkled additives bland bubble combination condense convert crush decoration devastate development disease distillation duration embed exposure frequently grind improve inadequate involve maintain mental metals nutrition ore physical potential pressure procedure purify quality recover reduce reversible separate severity sufficient taste vapour activity advantage affect arise beneath beneficial characteristics climate commercial contribute control crack create damage decrease disruption ecosystem environment greenhouse hazardous horizontal increase industrial mining pest pollution prevent production radiation recreational release responsible seriously shellfish sophisticated substance surface toxic unanticipated unexpected accelerate announcement approach approximately aspect audible automatic automobile commerce comparison consequently consist convenient curve demonstrate depart dispatch disproportionate entire equivalent extremely facilities indication infrastructure interlocking station intermediate station mobile neighbor off-peak overestimate passenger reflect relay residential route simplify society suspend traction unmanned access allow broadcast capable collaborate common communicative complex convey correspondence distant dock document dominate emerge enable enormous event facsimile machine image image impact include incur innovative location multiple option outweigh parallel participate receiver relevant retrieve salinity simultaneously site turbidity urgent vary

APPENDIX 5: WINTER'S (1978) LIST OF "TEXT-STRUCTURING" WORDS

achieve, addition, action, affirm, alike, analogous, antithesis, attitude, attribute, basis, case, cause, characteristic, change, common, compare, compatible, concede, conclude, condition, confirm, connect, consequence, constant, contradict, contrast, converse, correct, correspond, deduction, deny, depend, differ, differentiate, distinction, distinguish, effect, equal, error, evaluation, event, exemplify, exception, explanation, fact, feature, follow, form, function, general, grounds, hypothetical, identify, instance, instrumental, justification, kind, lead to, like, manner, match, matter, mean., means (of), method, name, object, opposite, move, observation, parallel, particular, point, problem, real, reason, reciprocate, repeat, replace, reply, requirement, resemble, respect, result, reverse, same, similar, situation, sort, solution, specify, state, subsequent, synonymous, technique, thing, time, truth, unique, way