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Appendix 1

STUDENT NEEDS ANALYSIS AND TEXTBOOK EVALUATION FORM

PETUNJUK PENGISIAN ANGKET

- Mohon angket diisi untuk menjawab seluruh pertanyaan dan pernyataan yang telah disediakan.
- Berilah lingkaran (O) pada pilihan jawaban yang tersedia dan pilih sesuai keadaan yang sebenarnya.
- Proses anda menjawab pertanyaan dan pernyataan dalam angket ini tidak ada jawaban yang salah. Oleh sebab itu, dimohon agar tidak ada jawaban yang dikosongkan.
- Jawaban anda akan dipergunakan untuk mengevaluasi materi Bahasa Inggris Teknik Elektronika yang selama ini anda pelajari dalam kelas di Politeknik Negeri Ujung Pandang.
- Terima kasih atas kesediaan anda mengisi angket penelitian ini.

1. Mengapa anda belajar bahasa inggris teknik?

- a. Membantu mengembangkan karir saya
- b. Membantu melanjutkan studi saya ke jenjang lebih tinggi
- c. Membantu memahami dan mengembangkan ilmu saya di bidang teknik
- d. Agar bisa berkomunikasi dalam bahasa Inggris
- e. Mengikuti mata kuliah yang ditawarkan dalam kurikulum sebagai salah satu syarat
- f. Alasan lain, tolong disebutkan

2. Dimana anda akan menggunakan bahasa Inggris yang selama ini anda pelajari (dalam konteks dan situasi seperti apa?)

- a. Di bengkel
- b. Di perusahaan
- c. Di luar negeri
- d. Alasan lain, tolong sebutkan

3. Seberapa penting kegiatan berikut dapat meningkatkan tanggapan mahasiswa yang kreatif, orisinal dan independen dalam pembelajaran bahasa Inggris teknik? Lingkari jawaban anda

1=sangat penting	2=cukup penting	3= tidak terlalu penting	4= tidak penting
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Role play (permainan peran)	1	2	3	4
Language game (permainan)	1	2	3	4
Berdiskusi dengan teman	1	2	3	4
Menghafal percakapan	1	2	3	4
Menerjemahkan materi bacaan	1	2	3	4

4. Apakah anda suka dengan metode pembelajaran di bawah ini? Lingkari jawaban anda

- Secara individual ya / tidak
- Secara berpasangan ya / tidak
- Secara berkelompok ya / tidak
- Jawaban lain, tolong sebutkan

5. Dari 4 skill dibawah ini, seberapa sering skill tersebut anda butuhkan dalam pembelajaran bahasa Inggris Teknik? Silahkan lingkari

	Sangat sering	sering	Kadang-kadang	jarang	Tidak pernah
Membaca (reading)	1	2	3	4	5
Menulis (writing)	1	2	3	4	5
Berbicara (speaking)	1	2	3	4	5
Mendengar (listening)	1	2	3	4	5

6. Dari keterampilan berbahasa inggris di bawah ini, keterampilan manakah yang anda rasakan sulit?

	Sangat sering	Sering	Kadang-kadang	jarang	Tidak pernah
Membaca (reading)	1	2	3	4	5
Menulis (writing)	1	2	3	4	5
Berbicara (speaking)	1	2	3	4	5
Mendengar (listening)	1	2	3	4	5

7. Apakah materi bahasa Inggris Teknik yang selama ini anda pelajari memenuhi kebutuhan anda?

- a. Ya
- b. Tidak

8. Jika jawaban nomor 3 tidak, mengapa?

- a. Materinya membosankan
- b. Tidak relevan dengan bahasa Inggris Teknik
- c. Metode pengajaran tidak sesuai kebutuhan mahasiswa
- d. Alasan lain, tolong sebutkan

9. Menurut anda, bagaimana seharusnya materi bahasa inggris yang baik untuk mahasiswa teknik elektronika?

- a. Materinya lebih banyak berhubungan dengan bidang teknik elektronika
- b. Materinya banyak menguraikan grammar
- c. Materinya harus banyak memberi terjemahan
- d. Materinya menyangkut bahasa Inggris umum
- e. Alasan lain, tolong sebutkan

10. Seberapa besar buku atau materi yang selama ini anda pelajari di kampus membantu anda dalam tugas atau kegiatan berikut ini. Lingkari jawaban anda

1=banyak membantu	2=sedikit membantu	3=kurang membantu	4=tidak membantu
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Berbicara dalam bahasa Inggris terkait tentang topik teknik elektronika	1	2	3	4
Menulis dalam bahasa Inggris terkait tentang topik teknik elektronika	1	2	3	4
Membaca buku-buku bahasa Inggris tentang teknik	1	2	3	4
Memahami tugas kuliah, bahan kuliah yang berkaitan dengan teknik elektronika	1	2	3	4
Menerjemahkan materi-materi yang berkaitan dengan teknik	1	2	3	4

11. Pada level manakah kemampuan bahasa Inggris anda?

- Basic (lower)** : mengetahui beberapa kata dan ungkapan bahasa Inggris yang sudah ada; tidak bisa mengatur alur percakapan; masih sangat terbatas dalam merespon pertanyaan dan percakapan untuk topik-topik tertentu; sangat terbatas pada pembendaharaan kata, tata bahasa, pengetahuan tentang idiom, pengucapan bahasa Inggris masih sangat dipengaruhi bahasa ibu.
- Basic (upper)** : hanya mengetahui beberapa kata-kata dan ungkapan umum; sudah sedikit bisa bercakap untuk percakapan pendek pada beberapa topik tertentu; pembendaharaan kata, tata bahasa dan idiom sudah sedikit meningkat; pengucapan bahasa Inggris masih sangat dipengaruhi oleh bahasa ibu.
- Intermediate (lower)** : sudah cukup lancar dalam berkomunikasi pada topik-topik tertentu, tetapi masih susah berkomunikasi untuk topik-topik yang belum diprediksi sebelumnya, masih mempunyai masalah pada pembendaharaan kata, tata bahasa, idiom dan pengucapan.
- Intermediate (upper)** : sudah bisa berkomunikasi dengan baik untuk situasi dan topik yang umum dikenal, walaupun masih mempunyai masalah dengan pembendaharaan kata, idiom, tata bahasa, pengucapan bahasa Inggris.

- e. **Advanced** : sudah bisa berkomunikasi dengan lancar dan alami untuk semua topik dan situasi; kesulitan pada pembendaharaan kata, idiom, tata bahasa dan pengucapan sudah sangat sedikit.

Adapted from:
Litz, R.A David . 2005. *Textbook Evaluation and ELT Management: A South Korean Case Study*. Asian EFL Journal. Retrieved from:
<http://www.scribd.com/doc/60575380/4/textnook-evaluation-scheme>. Access date: 2 December 2011

Appendix 2

STUDENT TEXTBOOK EVALUATION FORM

Lingkari jawaban anda jika:

5=sangat setuju	4=setuju	3=agak setuju	2=tidak setuju	1=sangat tidak setuju
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A. AKTIVITAS

1. Buku yang selama ini anda pelajari memberikan keseimbangan antara teori dan praktek.
5 4 3 2 1
2. Kegiatan yang dilakukan mendorong mahasiswa untuk lebih komunikatif
5 4 3 2 1
3. Kegiatan yang dilakukan menggabungkan antara pembelajaran individu, berpasangan dan kelompok
5 4 3 2 1
4. Kegiatan yang dilakukan memberikan contoh yang ada di kehidupan nyata (autentik) yang sesuai dengan bidang anda sebagai teknisi seperti merangkai komponen atau membuat alat elektronik
5 4 3 2 1

B. SKILLS

5. Buku yang selama ini anda pelajari berfokus pada kemampuan bahasa Inggris yang anda butuhkan
5 4 3 2 1
6. Buku yang selama ini anda pelajari memuat keempat skill bahasa inggris (listening, speaking, reading dan writing)
5 4 3 2 1

7. Buku yang selama ini anda pelajari juga berfokus pada sub-skill seperti percakapan di bengkel, cara mendapat inti pembicaraan dari percakapan yang didengar.

5 4 3 2 1

8. Materi listening, speaking, reading atau writing yang disajikan dalam buku sesuai dengan kebutuhan anda sebagai teknisi.

5 4 3 2 1

C. TIPE BAHASA DAN GRAMMAR

9. Bahasa yang terdapat dalam buku merupakan bahasa yang menggambarkan kehidupan nyata yang sesuai dengan kebutuhan anda (misalnya kegiatan di bengkel kerja, percakapan antara teknisi)

5 4 3 2 1

10. Bahasa yang digunakan sesuai dengan kemampuan bahasa Inggris yang anda miliki.

5 4 3 2 1

11. Grammar dan kosakata dalam buku yang selama ini anda pelajari memberikan anda motivasi

5 4 3 2 1

12. Tingkatan grammar dan kosakata dalam buku yang selama ini anda pelajari sudah sesuai dengan kemampuan anda

5 4 3 2 1

13. Grammar yang diberikan disertai dengan contoh dan penjelasan yang mudah, jelas dan sesuai dengan konteks bidang teknik

5 4 3 2 1

D. LEVEL KEMAMPUAN

14. Buku atau materi yang anda pelajari membantu anda meningkatkan level kemampuan bahasa Inggris anda

5 4 3 2 1

15. Materi pembahasan secara umum dalam buku sesuai dengan level kemampuan bahasa Inggris anda.

5 4 3 2 1

16. Level kemampuan bahasa Inggris anda meningkat setelah mengikuti perkuliahan dalam kelas

5	4	3	2	1
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E. SUBJEK DAN ISI BUKU

17. Subjek, topik dan materi pembahasan dari buku yang anda pelajari sesuai dengan kebutuhan anda sebagai teknisi

5	4	3	2	1
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18. Subjek, topik dan materi pembahasan dari buku yang anda pelajari menarik, menantang dan memotivasi anda

5	4	3	2	1
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19. Subjek, topik dan materi pembahasan dalam buku cukup bervariasi

5	4	3	2	1
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20. Subjek, topik dan materi pembahasan dalam buku sesuai dengan kultur/budaya bahasa Inggris

5	4	3	2	1
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21. Subjek, topik dan materi pembahasan dalam buku membantu anda memahami hal-hal yang berkaitan dengan bidang teknik (seperti memahami buku teknik, memahami kegiatan yang berkaitan dengan teknik, seperti merangkai komponen, membuat alat elektronik)

5	4	3	2	1
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22. Materi dalam buku yang selama ini anda pelajari memuat fungsi-fungsi bahasa Inggris seperti bagaimana melakukan instruksi kerja, merakit komponen, dan menjelaskan kegunaan alat)

5	4	3	2	1
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23. Fungsi-fungsi bahasa Inggris yang terdapat dalam buku sudah sesuai dengan yang anda inginkan dan sesuai dengan bidang anda sebagai teknisi.

5	4	3	2	1
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F. EVALUASI UMUM

24. Buku yang selama ini anda pelajari lebih meningkatkan ketertarikan anda mempelajari bahasa Inggris.

5 4 3 2 1

25. Anda akan menggunakan lagi buku pelajaran tersebut

5 4 3 2 1

Adapted from:

Litz, R.A David . 2005. *Textbook Evaluation and ELT Management: A South Korean Case Study*. Asian EFL Journal. Retrieved from: <http://www.scribd.com/doc/60575380/4/textbook-evaluation-scheme>. Access date: 2 December 2011

Appendix 3

QUESTIONNAIRE FOR LECTURERS

PETUNJUK PENGISIAN ANGKET

- Mohon angket diisi untuk menjawab seluruh pertanyaan dan pernyataan yang telah disediakan.
- Berilah lingkaran (O) pada pilihan jawaban yang tersedia dan pilih sesuai keadaan yang sebenarnya.
- Proses anda menjawab pertanyaan dan pernyataan dalam angket ini tidak ada jawaban yang salah. Oleh sebab itu, dimohon agar tidak ada jawaban yang dikosongkan.
- Jawaban anda akan dipergunakan untuk mengevaluasi materi Bahasa Inggris Teknik Elektronika yang selama ini anda pelajari dalam kelas di Politeknik Negeri Ujung Pandang.
- Terima kasih atas kesediaan anda mengisi angket penelitian ini.

1. Apakah materi bahasa Inggris Teknik memenuhi kebutuhan mahasiswa?

- a. Ya
- b. Tidak

Jika tidak, mengapa?

2. Apakah Bahasa Inggris Teknik bermanfaat bagi mahasiswa?

- a. Sangat bermanfaat
- b. Bermanfaat
- c. Tidak terlalu bermanfaat
- d. Tidak bermanfaat

Tolong jelaskan,

3. Apakah mahasiswa tertarik dengan topic-topik bahasa inggris yang berhubungan dengan bidang teknik?

- a. Sangat tertarik
- b. Tertarik
- c. Tidak terlalu tertarik

- d. Tidak tertarik
Tolong jelaskan,

4. Keuntungan apa yang diharapkan dari pelajaran bahasa Inggris bagi mahasiswa Politeknik Negeri Ujung Pandang?
- Membantu mahasiswa dalam mengembangkan ilmunya
 - Membantu mahasiswa untuk melanjutkan pendidikan
 - Membantu mahasiswa agar bias berkomunikasi dalam bahasa Inggris
 - Membantu mahasiswa dalam mengembangkan karirnya
 - Lain-lain, tolong disebutkan

5. Menurut anda, bagaimana seharusnya materi bahasa Inggris yang baik untuk mahasiswa teknik elektronika?
- Materinya lebih banyak berhubungan dengan bidang teknik elektronika
 - Materinya banyak menguraikan grammar
 - Materinya harus banyak memberi terjemahan
 - Materinya menyangkut bahasa Inggris umum
 - Alasan lain, sebutkan

6. Seberapa besar buku atau materi yang diajarkan membantu mahasiswa dalam tugas/aktivitas berikut ini

1=banyak membantu	2=sedikit membantu	3=kurang membantu	4=tidak membantu
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Berbicara dalam bahasa Inggris terkait tentang topik teknik elektronika	1	2	3	4
Menulis dalam bahasa Inggris terkait tentang topik teknik elektronika	1	2	3	4
Membaca buku-buku bahasa Inggris tentang teknik	1	2	3	4
Memahami tugas kuliah, bahan kuliah yang berkaitan dengan teknik elektronika	1	2	3	4

Menerjemahkan materi-materi yang berkaitan dengan teknik	1	2	3	4
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7. Seberapa penting kegiatan berikut ini dalam pembelajaran bahasa Inggris teknik? Lingkari jawaban anda.

1=sangat penting	2=cukup penting	3= tidak terlalu penting	4= tidak penting
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Role play (permainan peran)	1	2	3	4
Language game (permainan)	1	2	3	4
Berdiskusi dengan teman	1	2	3	4
Menghafal percakapan	1	2	3	4
Menerjemahkan materi bacaan	1	2	3	4

8. Dari 4 skill di bawah ini, seberapa sering skill tersebut mahasiswa butuhkan dalam pembelajaran bahasa Inggris teknik? (silahkan lingkari)

	Sangat sering	Sering	Kadang-kadang	jarang	Tidak pernah
Membaca (reading)	1	2	3	4	5
Menulis (writing)	1	2	3	4	5
Berbicara (speaking)	1	2	3	4	5
Mendengar (listening)	1	2	3	4	5

9. Berikan komentar anda tentang kemampuan bahasa Inggris mahasiswa setelah mengikuti materi pembelajaran di kelas
- Sangat baik
 - Baik
 - Cukup baik
 - Tidak terlalu baik
 - Sangat kurang
10. Berikan saran anda cara meningkatkan keterampilan berbahasa Inggris yang diperlukan oleh mahasiswa Politeknik Negeri Ujung Pandang
- Materinya terkait dengan bahasa Inggris teknik
 - Materinya harus lebih praktis

- c. Meningkatkan metode pengajaran
 - d. Lain-lain
-

Lingkari jawaban anda, jika:

5=sangat setuju	4=setuju	3=agak setuju	2=tidak setuju	1=sangat tidak setuju
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11. Subjek dan materi dalam buku sesuai dengan visi dan misi Politeknik Negeri Ujung Pandang

5 4 3 2 1

12. Subjek dan materi dalam buku sesuai dengan kurikulum Politeknik Negeri Ujung Pandang

5 4 3 2 1

13. Buku yang dipelajari mahasiswa sesuai dengan kebutuhan mereka sebagai teknisi

5 4 3 2 1

14. Buku yang dipelajari mahasiswa memberika keseimbangan antara teori dan praktek

5 4 3 2 1

15. Materi dalam buku memberikan contoh-contoh yang nyata sesuai dengan kebutuhan mahasiswa sebagai teknisi

5 4 3 2 1

16. Buku yang dipelajari mahasiswa memuat keempat skill bahasa inggris (listening, speaking, reading dan writing) dan porsinya seimbang

5 4 3 2 1

17. Grammar/tata bahasa dalam buku disampaikan dengan jelas dan mudah dan disertai contoh dan penjelasan

5 4 3 2 1

18. Subjek, isi dan materi pembahasan dalam buku menarik, menantang dan memberikan motivasi

5 4 3 2 1

19. Buku yang dipelajari mahasiswa meningkatkan ketertarikan dan motivasi mereka dalam mempelajari bahasa Inggris

5 4 3 2 1

20. Saya menyarankan buku tersebut digunakan dalam pembelajaran bahasa Inggris di Politeknik Negeri Ujung Pandang

5 4 3 2 1

Adapted from:

Litz, R.A David . 2005. *Textbook Evaluation and ELT Management: A South Korean Case Study*. Asian EFL Journal. Retrieved from: <http://www.scribd.com/doc/60575380/4/textbook-evaluation-scheme>. Access date: 2 December 2011.

Appendix 4

LIST OF INTERVIEW QUESTIONS

1. Why are you studying English language?
2. Where did you expect to use English in the future?
3. Order the following language skills from important to unimportant:
Reading listening vocabulary
Writing speaking grammar
4. What do you expect to learn from this class?
5. What are your language strengths and weaknesses?
6. Do you have a preferred learning style? If so, what is it?
7. Do you prefer to learn individually, in pairs or in a group?
8. Do you like using the textbook? Why or why not?

Adapted from:

Litz, R.A David . 2005. *Textbook Evaluation and ELT Management: A South Korean Case Study*. Asian EFL Journal. Retrieved from: <http://www.scribd.com/doc/60575380/4/textnook-evaluation-scheme>. Access date: 2 December 2011

Appendix 5

CHECKLIST FOR EVALUATION OF THE TEXTBOOK

Aims and approaches

- Do the aims of the textbook correspond closely with the needs of the learners?
- Is the textbook suited the learning situation?
- Does the textbook cover most or all of what is needed? Is it a good resource for students and lecturers?
- Does the textbook allow different teaching and learning style?

Design and organization

- What components make up the total learning teaching package?
- How is the content organized?
- Is the grading and progression suitable for the learners? Does it allow them to complete the work needed to meet any external syllabus requirements?
- Are there reference sections for grammar? Is some of the material suitable for individual study?
- Is it easy to find out the way around the textbook? Is the layout clear?

Language content

- Does the textbook cover the main grammar items appropriate to each level?
- Is material for vocabulary teaching adequate in terms of quantity and range of vocabulary, emphasis placed on vocabulary development, strategies for individual learning?
- Does the textbook deal with the structuring and conventions of language use above sentence level, for example, how to take part in conversation, how to structure a piece of extended writing, how to identify the main points in reading passage?

Skills

- Are all four skills adequately covered, bearing in mind the teaching learning aims and syllabus requirements?
- Is there material for integrated skill work?
- Are reading passages and associated activities suitable for student's levels, interests? Is there sufficient reading material?
- Is listening material well recorded, as authentic as possible, accompanied by background information, questions, and activities which help comprehension?
- Is material for spoken English language well designed to equip learners for real life interactions?
- Are writing activities suitable in terms of amount of guidance/control degree of accuracy, organization of longer pieces of writing and use of appropriate styles?

Topic

- Is there sufficient material of genuine interest to learners?
- Is there enough variety and range of topic?
- Are the topics help expand students' awareness and enrich their experience?
- Are the topics sophisticated enough in content, yet within the learners' language level?
- Will the students be able to relate to the social and cultural contexts presented in the textbook?

Practical considerations

- What does the whole package cost? Does this represent good value for money?
- Are the textbooks strong and long-lasting? Are they attractive in appearance?

- Do any parts of the package require particular equipment, such as a language laboratory, listening centre or video player? If so, do the students have the equipment available for use and is it reliable?

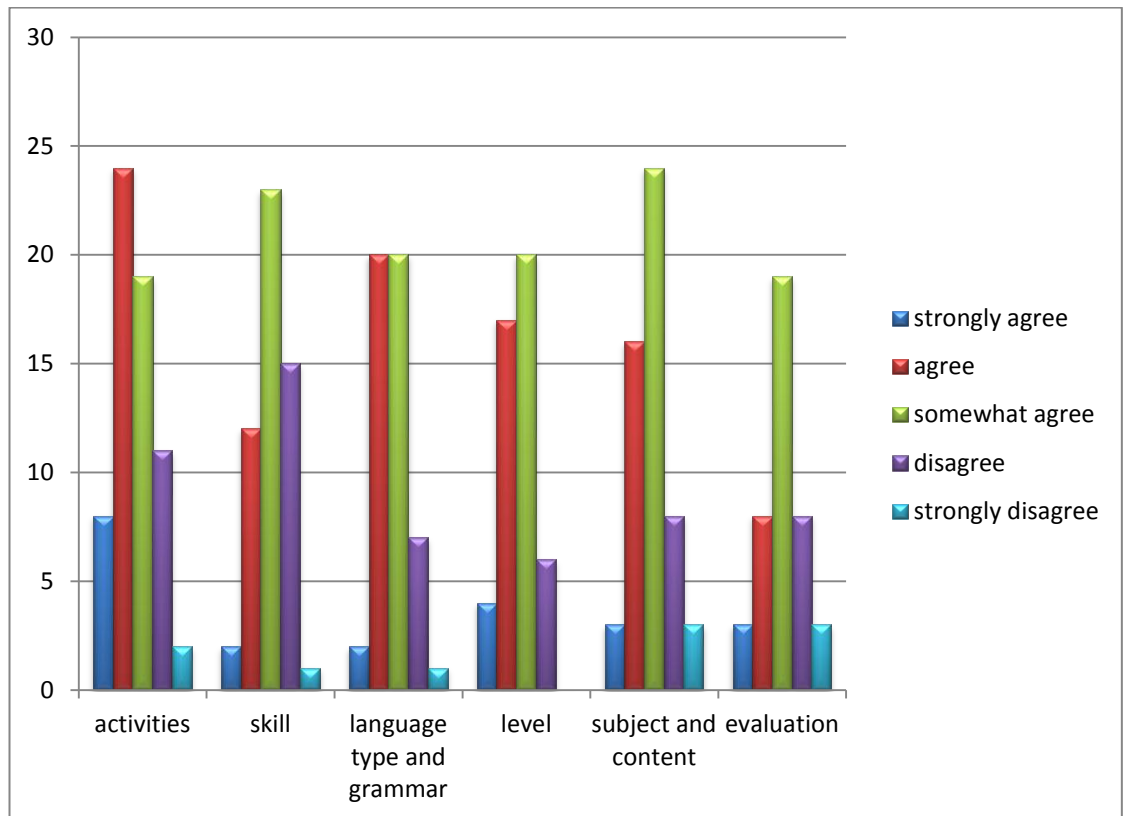
Adapted from:

Richard, J.C. 2001. *Curriculum Development in Language Teaching*. Cambridge: Cambridge University Press

Appendix 6

RESULT OF STUDENTS' TEXTBOOK EVALUATION

Figure 1.



Appendix 7

Classroom Observation Result

variables	Responses
Aims and approaches	<ul style="list-style-type: none"> • The aims of the textbook correspond closely with the needs of the learners • The textbook suited the learning situation • The textbook covers most or all of what is needed and a good resource for students and lecturers • The textbook allows different teaching and learning style
Design and organization	<ul style="list-style-type: none"> • The content is well organized • There are reference sections for grammar and some of the materials are suitable for individual, in pair and group study • It is easy to find out the way around the textbook and the layout is clear
Language content	<ul style="list-style-type: none"> • Materials are for vocabulary teaching adequate in terms of quantity and range of vocabulary, emphasis placed on vocabulary development, strategies for individual learning • The textbook deals with the structuring and conventions of language use above sentence level.
skills	<ul style="list-style-type: none"> • There is material for integrated skill work • Reading passages and associated activities are suitable for student's levels, interests, there is sufficient reading material • Listening material is not well recorded, as authentic as possible, accompanied by background information, questions, and activities which help comprehension • Material for spoken English language is not well design to equip learners for real life interactions • Writing activities are suitable in terms of amount of guidance/control degree of accuracy, organization of longer pieces of writing and use of appropriate styles
topics	<ul style="list-style-type: none"> • There is sufficient material of genuine interest to learners • There is enough variety and range of topic • The topic helped expand students' awareness and enrich their experience • The topics are sophisticated enough in content, yet within the learners' language level • The students are not fully able to relate to the social and cultural contexts presented in the textbook
Practical consideration	<ul style="list-style-type: none"> • The textbooks are strong and long-lasting, but not attractive in appearance • Some parts of the package require particular equipment, such as a language laboratory, listening centre but the students have not the equipment available for use.

Appendix 8

THE EXISTING MATERIALS

2 Electrical Engineering and Electronics

EXERCISE B Contextual reference

What do the pronouns in italics in these sentences refer to?

1. All materials can be classified into three groups according to how readily *they* permit an electric current to flow. (line 3)
 - (a) three groups
 - (b) all materials
 - (c) free electrons
2. Under certain conditions *they* allow a current to flow easily but under others they behave as insulators. (line 16)
 - (a) conductors
 - (b) semiconductors
 - (c) insulators
3. *These* are known as thermistors. (line 18)
 - (a) metallic oxides
 - (b) semiconductors
 - (c) mixtures of certain metallic oxides
4. *They* are therefore used in temperature-sensing devices. (line 20)
 - (a) thermistors
 - (b) semiconductors
 - (c) metallic oxides

EXERCISE C Checking facts and ideas

Decide if these statements are true or false. Quote from the passage to support your decisions.

1. Electrons flow from positive to negative.
2. Copper provides an easy path for an electric current.
3. All metals are good conductors.
4. All good conductors are metals.
5. Air is not a perfect insulator.
6. Rubber readily releases electrons.
7. The resistance of a thermistor is higher at low temperatures than at high temperatures.

II USE OF LANGUAGE

EXERCISE D Describing shapes

Study these nouns and adjectives for describing the shapes of objects:

I READING AND COMPREHENSION

CONDUCTORS, INSULATORS AND SEMICONDUCTORS

If we connect a battery across a body, there is a movement of free electrons towards the positive end. This movement of electrons is an electric current. All materials can be classified into three groups according to how readily they permit an electric current to flow. These are: conductors, insulators and semiconductors.

In the first category are substances which provide an easy path for an electric current. All metals are conductors, however some metals do not conduct well. Manganin, for example, is a poor conductor. Copper is a good conductor, therefore it is widely used for cables. A non-metal which conducts well is carbon. Salt water is an example of a liquid conductor.

A material which does not easily release electrons is called an insulator. Rubber, nylon, porcelain and air are all insulators. There are no perfect insulators. All insulators will allow some flow of electrons, however this can usually be ignored because the flow they permit is so small.

Semiconductors are midway between conductors and insulators. Under certain conditions they allow a current to flow easily but under others they behave as insulators. Germanium and silicon are semiconductors. Mixtures of certain metallic oxides also act as semiconductors. These are known as thermistors. The resistance of thermistors falls rapidly as their temperature rises. They are therefore used in temperature-sensing devices.

EXERCISE A Rephrasing

Rewrite the following sentences, replacing the words in italics with expressions from the passage which have similar meanings.

1. The *flow* of free electrons is an electric current.
2. Materials in the first *group* are called conductors.
3. *Materials* which provide a path for an electric current are conductors.
4. All insulators *permit* some flow of electrons.
5. Germanium sometimes *acts* as an insulator and sometimes as a conductor.

shape	noun	adjective	shape	noun	adjective
2 dimensional	circle	circular	3 dimensional	sphere	spherical
	semi-circle	semi-circular		cylinder	cylindrical
	square	square		tube	tubular
	rectangle	rectangular		—	rectangular
	lines			edges	
	—	straight		—	rounded
	~	curved		—	pointed

When something has a regular geometric shape we can use one of the adjectives from the table to describe it.

EXAMPLE



a square wave

When the object has no recognized geometric shape but does resemble a well-known object or a letter of the alphabet, it may be described in one of the following ways:

EXAMPLES

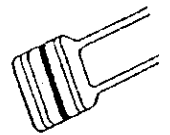


an H-shaped antenna

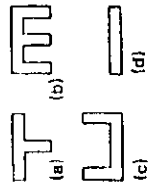


a saw-tooth wave

Now describe the shapes of the following objects as completely as possible:



1. a ceramic capacitor



2. transformer laminations

4 Electrical Engineering and Electronics



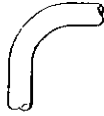
3. an electrolytic capacitor



4. an antenna



5. a magnet



6. a cable conduit



7. a carbon brush



8. a capacitor



9. a motor pole shoe



10. a resistor

EXERCISE E Describing position and connection

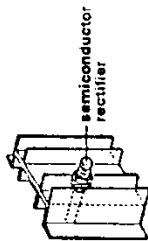
When describing the position of a component or how it is connected in a circuit, phrases of this pattern are used:

be + past participle + preposition

EXAMPLES



1. The tuning capacitor IS CONNECTED ACROSS the coil.



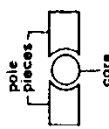
2. The semiconductor rectifier is MOUNTED ON the heat sink.

Now complete each sentence using an appropriate phrase from this list:

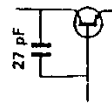
- wound round
- connected across
- mounted on
- wired to
- located within
- applied to
- connected to
- connected between



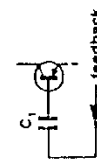
1. The bulbs are the battery.



2. The core is the pole pieces.



3. The 27pF capacitor is the collector and the base.



5. Feedback voltage is the base of the transistor through C_1 .



7. The coil is an iron core.

8. The negative pole of the battery earth.

EXERCISE F Writing instructions 1

Simple instructions use the infinitive.

EXAMPLES

1. Measure the collector current.
2. Switch off the supply.
3. Do not solder transistors without a heat-shunt.

Study these instructions for an experiment to measure the total resistance of resistors in series using the circuit in Figure 1.

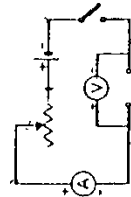


FIGURE 1

1. Use a high-resistance voltmeter and a low-resistance ammeter.
2. Connect R_1 across A B.
3. Close the switch and adjust the rheostat until both meters show almost full scale deflection.
4. Take simultaneous readings of both voltage and current.
5. Calculate R_1 by the formula $R = \frac{E}{I}$.
6. Repeat this for R_2 .
7. Connect R_1 and R_2 in series across A B.
8. Calculate the total resistance using the same formula as before.
9. Tabulate the results.

Now write your own instructions for an experiment to measure the total resistance of resistors in parallel, using the same circuit. Begin like this:

1. Connect up the apparatus as shown in Figure 1.

EXERCISE G Describing an experiment

Make a description of the first experiment in Exercise F by rewriting each instruction in the present passive.

EXAMPLE

1. Use a high-resistance voltmeter and a low-resistance ammeter.
A HIGH-RESISTANCE VOLT-METER AND A LOW-RESISTANCE AMMETER ARE USED.

EXERCISE H Reporting an experiment

Make a report of the second experiment in Exercise F by rewriting each of your instructions in the past passive.

EXAMPLE

1. Connect up the apparatus as shown in Figure 1.
THE APPARATUS WAS CONNECTED UP AS SHOWN IN FIGURE 1.

EXERCISE I Writing instructions 2

Study this description of how batteries are charged:

The filler plugs are removed and the battery is connected to the charger. It must be ensured that the correct polarity is observed and good connections are made. The charger is then switched on. The charger is switched off when the battery has been fully charged. The specific gravity of a sample cell is checked. The filler plugs are replaced and the battery left to cool before use.

Now begin a list of instructions for how to charge a battery. Begin like this:

1. Remove the filler plugs.

EXERCISE J Relative clauses 1

Study these sentences:

1. Starter motor brushes are made of carbon.
 2. The carbon contains copper.
- Both these sentences refer to carbon. We can link them by making sentence 2 a relative clause.

1 + 2. Starter motor brushes are made of carbon **WHICH** CONTAINS COPPER.
The *relative clause* is in capitals. Note that **THE CARBON** in sentence 2 becomes **WHICH**

Study these other pairs of sentences and note how they are linked:

3. Consumers are supplied at higher voltages than domestic consumers.
4. These consumers use large quantities of energy.
- 3 + 4. Consumers **WHO USE LARGE QUANTITIES OF ENERGY** are supplied at higher voltages than domestic consumers.
5. 33kV lines are fed to intermediate substations.
6. In the intermediate substations the voltage is stepped down to 11kV.
- 5 + 6. 33kV lines are fed to intermediate substations **WHERE THE VOLTAGE IS STEPPED DOWN TO 11kV.**

Now link these sentences. Make the second sentence in each pair a relative clause:

1. The coil is connected in series with a resistor.
The resistor has a value of 240 ohms.
2. The supply is fed to a distribution substation.
The supply is reduced to 415 V in the distribution substation.
3. Workers require a high degree of illumination.
The workers assemble very small precision instruments.
4. Manganin is a metal.
This metal has a comparatively high resistance.
5. The signal passes to the detector.
The signal is rectified by the detector.
6. A milliammeter is an instrument.
The instrument is used for measuring small currents.
7. Workers require illumination of 300 lux.
The workers assemble heavy machinery.
8. Armoured cables are used in places.
There is a risk of mechanical damage in these places.

EXERCISE K Reason and result connectives 1

Study these sentences:

1. Copper is used for cables.
2. Copper is a good conductor.

Sentence 1 tells us what copper is used for. Sentence 2 tells us why it is used. Sentence 2 provides a reason for sentence 1. We can link a statement and a reason using *because*.

1 + 2. Copper is used for cables **BECAUSE** it is a good conductor.
When the reason is a noun or a noun phrase, we use *because of*.

EXAMPLE

The motor overheated **BECAUSE OF** dirt in the air gap.

Now study this pair:

3. The flow of electrons through an insulator is very small.
 4. The flow can be ignored.
- Sentence 4 is the result of sentence 3. We can link a statement and a result using *therefore*.
- 3 + 4. The flow of electrons through an insulator is very small, THEREFORE it can be ignored.

Note that a comma is used before *therefore*.

Now link these ideas using *because* or *therefore*.

1. Soft iron is used in electromagnets.
Soft iron can be magnetized easily.
2. The voltage is 250 V and the current 5 A.
The resistance is 50 Ω .
3. Pvc is used to cover cables.
Pvc is a good insulator.
4. Transistors can be damaged by heat.
Care must be taken when soldering transistors.
5. Capacitance is usually measured in microfarads or picofarads.
The farad is too large a unit.
6. Output transistors are mounted on a heat sink.
Output transistors generate heat.
7. It is easy to control the speed of dc motors.
Dc motors are used when variable speeds are required.
8. A cathode-ray tube screen glows when an electron beam strikes it.
The screen is coated with a phosphor.

EXERCISE L *Pronoun links between sentences*

When we link sentences together, or into paragraphs, repeated nouns usually become pronouns.

EXAMPLES

1. A short circuit occurs in a transformer.
2. The short circuit may cause overheating.
3. The overheating may further damage the insulation.
When a short circuit occurs in a transformer, it may cause overheating. This may further damage the insulation.

When there may be misunderstanding, or when the repeated noun comes a long time after its first mention, the full noun is used.

EXAMPLE

First the pole shoes and coils are drawn out of the yoke. Then the coils are removed from them and new coils are fitted over them. Next they are refitted inside the yoke and located by lightly tightening the fixing screws. Finally they are tightened fully and their terminals are soldered.

Compare this version where the full nouns have been kept:

First the pole shoes and coils are drawn out of the yoke. Then the coils are removed from the shoes and new coils fitted over the shoes. Next the shoes are refitted inside the yoke and located by lightly tightening the fixing screws. Finally the screws are tightened fully and the new coil terminals are soldered.

Now replace the repeated nouns in this paragraph with suitable pronouns where there is no likelihood of confusion.

A transformer is a device which changes the magnitude of an ac voltage. The transformer consists of a primary coil to which the input is applied, and a secondary coil from which the output is obtained. The coils are insulated and wound round a former. The coils have a core of soft iron on which the former is mounted. The core is made from many thin sheets or laminations. The sheets are oxidized so that the sheets are insulated from each other. Oxidizing the sheets reduces eddy losses.

III INFORMATION TRANSFER

EXERCISE M *Mathematical symbols used in electrical engineering and electronics*

Study the table of mathematical symbols used in electrical engineering and electronics in Appendix 1. Then write out the following expressions in full.

EXAMPLE

$$I = \frac{E}{R}$$

I is equal to E over R.

1. $P = I^2 \times R$
2. $\frac{1}{R_{\text{tot}}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$
3. $B \propto H$
4. $X_L = \sqrt{Z^2 - R^2}$
5. $E = IR$
6. Frequency stability $\approx 0.04\% / ^\circ\text{C}$
7. $\frac{\text{output frequency}}{\text{input frequency}} \approx 10:1$
8. $Z = \frac{100 \times 10^{-3}}{200 \times 10^{-3}}$
9. collector dissipation ≈ 12 milliwatts
10. tolerance $\pm 5\%$

IV GUIDED WRITING

STAGE 1 Sentence building

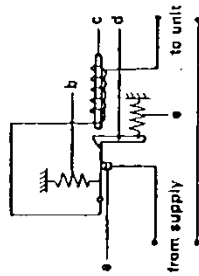
Join the following groups of sentences to make ten longer sentences. Use the words printed in italics at the beginning of each group. You may omit words and make whatever changes you think are necessary in the word order and punctuation of the sentences.

1. *or*
Circuits can be protected from excessive currents by a fuse.
Circuits can be protected from excessive currents by a circuit breaker.
2. *however*
3. *A fuse is the simplest and cheapest protection.*
For accurate and repetitive operation a circuit breaker is used.
4. *which*
The simplest circuit breaker consists of a solenoid and a switch with contacts.
The contacts are held closed by a latch.
4. *thus energizing*
The current from the supply line flows through the switch and solenoid coil.
5. *This energizes the solenoid.*
which, therefore
At normal currents the pull of the solenoid on the latch will not overcome the tension of the spring.
6. *The spring holds the latch in place.*
The switch remains closed.
6. *if*
The current rises to a dangerous level.
The pull of the solenoid on the latch increases.
7. *and*
The increased pull overcomes the latch spring tension.
The increased pull pulls the latch towards the solenoid.
8. *which*
This releases the switch contacts.
The switch contacts are pulled apart by a spring.
9. *as*
The circuit is now broken.
The unit is protected.
10. *when*
The fault in the supply or unit is put right.
The latch can be reset.

12 Electrical Engineering and Electronics

STAGE 2 Diagram labelling

Label this diagram with the following:
solenoid, latch, switch contacts, latch spring, switch spring



STAGE 3 Paragraph building

Group your completed sentences into two paragraphs. Label the diagram Figure 1 and insert a reference to it in the completed passage.

EXAMPLES

See Figure 1. Study Figure 1.

Finally give the passage a suitable title.

V READING AND SUMMARIZING

STAGE 1 *Comprehension*

Study this passage carefully and answer the questions which follow:

SUPERCONDUCTIVITY

The resistance of metals varies with their temperature. When they get hot, their resistance increases. When they cool, their resistance falls. The resistance of some metals and alloys steadily decreases as their temperature is lowered, then falls suddenly to a negligible value at temperatures a few
5 degrees above absolute zero (-273°C). In other words, these materials have almost no resistance to an electric current at very low temperatures. They become almost perfect conductors. This is called superconductivity. It occurs only with certain materials, for example lead, and only at very low temperatures.

10 The practical applications of superconductivity are limited because of the very low temperatures required. A number of uses, however, have been proposed. If a current is induced by a magnetic field in a ring of superconducting material, it will continue to circulate when the magnetic field is removed. In theory this could be made use of in the memory cells of
15 computers. Memory cells made of superconducting materials could store information indefinitely. Because of the zero resistivity of the cells, the information could be retrieved very quickly, as fast as 10^{-8} seconds.

Ninety per cent of the total losses in modern transformers is due to the resistance of the windings. Transformers could be made with windings
20 cooled to the low temperatures at which superconductivity occurs. The resistance of the windings would be zero and the transformer would be almost ideal. Similarly a 100% efficient electric motor has been proposed using the magnetic field of superconducting coils.

1. Name a superconducting material.
2. When do materials exhibit superconductivity?
3. Why are the practical applications limited?
4. What applications have been proposed?
5. What advantages would a memory cell made of a superconducting material have?
6. How efficient would transformers and motors be which used superconductivity?

STAGE 2 *Summarizing*

Complete this summary of the passage using your answers to Stage 1:

Some materials, for example become almost perfect conductors at

The applications of superconductivity are limited because

Possible uses are

A superconducting memory cell would allow information

A transformer or motor using superconductivity would be