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Are instructional design elements being used in module writing?

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Abstract

This paper discusses the elements of instructional design (ID) and technical design in module writing. An evaluation instrument was developed to evaluate the modules written by course lecturers from the School of Distance Education, Universiti Sains Malaysia. In the study, fifty modules (12%) were selected from the Arts, Science and Engineering courses. The findings of the evaluation showed that instructional modules were weak in a number of elements. The study recommended that multimedia and distance learning strategies should be integrated in the learning activities. Post-test and pre-test may be considered to make the learning modules more self-contained, self-instructional, and interactive. Courses on distance learning theories, instructional design and development, media selection, media attributes, multimedia production, media integration, utilisation and management in distance and open learning may help course writers to write better modules. The Centre needs to have a standard guideline for module writing. The present guidelines need to be improved to include other ID and technical elements in module writing.

Introduction

The Distance Education Programme at Universiti Sains Malaysia gives the opportunity for working adults to learn independently in terms of time and space, not face-to-face as in the conventional mode. The distance learners mainly use self-instructional materials commonly known as "modules" supported by remote classes using video or audio graphic conferencing, multimedia materials such as audio cassettes, recorded video tapes, computer-based materials and slides, communication technologies such as telephone, telegram, facsimile and internet. Dick and Carey (1990) defined the module as a self-instructional printed unit of instruction that has an integrated theme, provides students with information needed to acquire and assess specific skills and knowledge, and serves as one unit of a total curriculum. The instructional module needs to be systematically designed to facilitate learning without the constant supervision of a

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teacher. It requires the learners to interact actively with the instructional materials rather than simply allowing them to read the materials passively (Dick and Carey, 1990). It should be free standing and self-contained and designed to be used by individual distance learner or group-based instruction. Preferably, all elements of the conventional classroom teaching have to be built in the instructional unit. The module has to get the learner's attention, state instructional objectives, introduce the topic, recall previous learning, present new materials, provide examples and answers, provide practice and feedback, select appropriate media and learning strategies and give remedial and enrichment activities. This is similar to Gagne's instructional events in conventional face-to-face teaching.

This paper attempts to examine the instructional design (ID) elements and the technical design elements used in writing self-instructional modules. An evaluation instrument was developed to evaluate the modules written by the distance education lecturers from Centre for Distance Education, Universiti Sains Malaysia. The distance learners enrolled in the undergraduate degree programmes use these modules. The objectives of the evaluation are:

1. To identify the instructional design and technical elements needed in writing self-instructional modules;
2. To evaluate the use of ID in writing modules;
3. To suggest recommendations for the improvement of module writing.

The evaluation did not cover the content of the modules which is the responsibility of academic assessors or subject matter specialists. Thus far there is no comprehensive evaluation on the use of ID in module writing. The Centre's Educational Technology Committee evaluates the overall aspects of the modules when they are ready for publication.

Developing evaluation instrument

Continuous evaluation is needed to check and review the status of the module and the quality of the overall academic programme offered. One of the main components of a successful distance and open learning programme is the quality of its learning materials. Since the teacher and the learner are separated, the learning materials used should be teaching rather than informing.

The evaluation instrument developed was based on the instructional design components suggested by Dick and Carey (1990), Heinich *et al.* (1996) and Gagne's instructional events (1992). Dick and Carey (1990) and Heinich *et al.* (1996) agreed that there are several ways to write or design instructional modules. Usually designers may agree with the definition above but they differ in terms of the steps, elements and characteristics of the module. In the Dick and Carey model (1990), they proposed a systematic approach to designing an instructional unit or module. They identify nine steps in the design process:

1. Identify an instructional goal
2. Conduct an instructional analysis

3. Identify entry behaviours, characteristics
4. Write performance objectives
5. Develop criterion-referenced test items
6. Develop an instructional strategy
7. Develop and/or select instructional materials
8. Design and conduct the formative evaluation
9. Revise instruction.

The steps in Dick and Carey's model explain how to design the instructional product. Whereas, the design elements recommended by Heinich *et al.* (1996) suggest the main elements of module writing. Heinich's ID elements do not suggest procedural steps as in the Dick and Carey model and are therefore more suitable to evaluate the modules. They recommended that the following design elements are essential in designing instructional modules:

1. Rationale
2. Instructional objectives
3. Entry test
4. Multimedia materials
5. Learning activities
6. Self-test
7. Post-test.

However, these seven design elements do not include the instructional goal element that is common in any instructional design model. Richey (1986) summarised six core elements in instructional design process that include instructional goal as one of the core elements. The instructional goal states in broad terms the kind of skills and knowledge that the learner can do or attain at the end of the instructional unit. From the instructional goal, module writers can write down the instructional objectives that consist of the various specific skills and knowledge that the learner needs to master in order to reach the instructional goal. Heinich *et al.* (1996) may have excluded the instructional goal element to give more emphasis on specific instructional objectives rather than broad instructional goal. Moreover, the school may have already fixed the instructional goal. However, Dick and Carey (1990) believe that "it is almost always necessary for the designer to clarify and sometimes amplify the goal in order for it to serve as a firm starting point for the instructional design process". So the instructional goal element is added in the ID elements to develop the module evaluation instrument.

The eight ID elements are further elaborated to cover other sub elements that are useful in module writing. Gagne's learning hierarchy and instructional events (1992) and Bloom's learning taxonomy (Bloom *et al.*, 1956) are adapted in the final instrument. The ID elements are described in Section A and Tables 3 through 6 of the evaluation instrument.

The technical design in the evaluation instrument is adapted from the Centre's house style (See Table 1). Module writers may use the style as a guideline. The technical

elements for module writing are described in Section B and Table 7 of the evaluation instrument.

Module evaluation instrument

The evaluation instrument is divided into two sections: Instructional design elements and technical design elements. Section A consists of 8 instructional design elements and Section B consists of 7 technical elements.

Section A: Instructional design

In Section A, the following eight ID elements and sub elements were used to evaluate the modules:

1. Rationale: An overview of the content and its relation with other modules, the intended user, status of the course (eg, minor, optional, prerequisite or basic), reasons for using modules and the evaluation weight required for the course. Evaluation format consists of the distribution of grade (in percentage) for assignment/course work, tests, project, final examination and so forth.
2. Instructional goal(s). The general statement of what the learner is able to do and attain at the end of the instruction. The goal(s) is stated at the beginning of a module. For example, if a course has 4 modules, every module should have 4 instructional goals. From the instructional goal, module writers can write down the instructional objectives that consist of the various specific skills and knowledge that the learner needs to master in order to reach the instructional goal.
3. Instructional objectives: Stated in performance terms, the list of specific skills and knowledge that the learner needs to master after reading or following the module. The objectives are derived from the broad goal(s) statement and they are stated at the beginning of the instructional unit. Instructional objectives should be written clearly and accurately, arranged according to learning domains and learning hierarchy using Gagne's learning categories (1992) and Bloom's learning taxonomy (1956) and should cover the whole learning units.
4. Pre-entry test: This element is also important in the design of instructional module. The pre-entry test prepares the schema and knowledge structures that the learner requires before entering the learning unit. It provides the advanced organisers in learning (Ausubel, 1968) and the entry level knowledge or skills. Many studies show that pre-knowledge influences learner's performance.
5. Multimedia materials: Preparation of multimedia materials such as slides, pictures, charts, models, realia, text books, videos, web-based materials and training materials and equipment that can support printed modular learning. The use of varieties of media may utilise other learning senses and thus enhance learning. Courses that involve lab work or hands-on experience such as engineering and medicine need multimedia support. However, the media selected should assist in the attainment of learning objectives.
6. Learning activities: The learning activities should motivate learners and encourage learner interactions with teacher, learner, and learning materials. These interactions can create continuous two-way dialogue either in real-time or simulated dialogue

(Holmberg, 1977). Examples of two-way dialogue are in-text questions or exercises, use of interactive media that accompanies the module (simulated dialogue), discussions between teacher and learner and learner with learner (real-time dialogue), case studies, project work and experiment. The use of appropriate learning strategies, learning techniques and media can enhance learning. For example, the learner may be required to do an experiment in the lab (use of demonstration techniques and co-operative learning), be an apprentice in a workplace (situated learning), do a case study (inquiry and discovery technique) or construct a new idea in a real context (constructivism). Answers and guided examples should be included to make the module a self-standing learning material. In short, the learning activities should make learning interesting, active, interactive and meaningful. The learning activities involve the process of thinking, application, problem solving, and knowledge and skills construction. These processes may be done orally, in writing or through demonstration.

7. Self-tests: The self-tests are prepared to measure learner's progress in stages based on the content and learning objectives. The tests are given at the end of every learning unit or in between text to review and check learners' progress. Answers to the tests and guided examples should be included in the module. Self-test construction needs to consider the cognitive, psychomotor and affective domains and the sequence of the learning hierarchy that is beginning from lower level skills/knowledge to higher levels.
8. Post-test: The post-test is equally as important as the entry-level test. The post-test will measure the learner's performance based on the learning objectives at the end of every module. The learner may also compare his/her performance in the post-test with his/her previous performance in the entry-level test. Since distance learners learn without the teacher, the module, being self-instructional and self-contained, takes the responsibility of providing entry-level test and post-test.

Section B: Technical design

In Section B, the following technical elements and sub elements were evaluated. The seven technical elements and sub elements are adapted from the Centre's house style (see Table 1).

1. References: A list of references needs to be included at the end of every learning unit. The style needs to be consistent, for example APA style. The in-text references (author and year) should correspond with the references.
2. Layout: Is the text justified or unjustified? Is there enough space to write and read comfortably?
3. Format: Do the modules have the following elements?
   - Author/subject index
   - Glossary/terms
   - Dedication page
   - Preface page
   - Figures, diagrams or appendices pages
   - Contents page
   - Copyright page

- Cover page
- Author and title pages

4. Lettering: The size and font type used for adult learners. Do the modules use different font sizes for titles, headings and texts? Is the font type standardised throughout? Is the spacing consistent for texts, titles and headings?
5. Graphic: Do the modules have the following instructional graphic elements:
   - Simplicity
   - Position
   - Balance
   - Contrast
   - Rule of the third
   - Colour
6. Audio: Is the audio clear? Does the audio synchronise with the visuals? Is the special effect or music suitable for learning.
7. Visual: Are the visuals (static and/or motion) clear?

A four-point rating scale was used to measure the ID and technical elements found in the module. The scales used are:

1 = Very weak
2 = Weak
3 = Strong
4 = Very strong

Module writers

Most module writers have experience, skills and knowledge in writing instructional modules. The experience ranges from 2 to 15 years and they also teach distance learners. Some of the module writers were trained in Canada, United Kingdom, Australia and America. Most part-time lecturers got their training from the Centre itself. A few of the course lecturers are also former students of the distance education programme.

Technical guidelines in module writing

The technical design is set by the Centre and may be used as a guideline for the module writers. Table 1 opposite shows the standard format.

Methodology

Fifty modules (12%) out of 418 modules were selected involving 44 types of course (20%) out of 230 types of course from the Arts, Science and Engineering degree programmes. Five modules were selected from the engineering programme, 12 from the science programme and 33 from the Arts Programme (see Table 2). From the three degree programme, 41 modules were module 1, and 9 module 2 or 3. Module 1 is an introductory module and usually consists of elements such as rationale, target learners, evaluation procedures and overview of the other companion modules. Fifty modules were evaluated using the eight ID elements from the ID section and seven technical elements from the technical design section of the evaluation instrument. The ID and

Table 1: Module technical guidelines/format

Module cover (includes author and title)
Copyright page
Contents page
Preface
Instructional symbols
Instructional goal (upper case and bold)
Introduction
Instructional objective (12 point and bold)
In-text question (upper case and bold)
Summary
Self-test
Answers to self-test
Reference
Lettering and layout
Spacing: 1.5 inch
Font: Times, 10–12 point
Page format: top = 1 inch, bottom = 1 inch, left = 1.25 inch, right = 1.25 inch

(Source: Computer Graphic Unit, Centre for Distance Education, Universiti Sains Malaysia.)

Table 2: Number of modules evaluated

Programme	*No. of courses*	*No. of modules*	*Percentage*	*Total*
Engineering	5	5	8.7	57
Science	12	12	8.0	151
Arts	27	33	15.7	210

technical elements were analysed using the SPSS package. Percentage and frequency count and mean score were used to analyse the data. The instructional designers from the Centre validated the module evaluation instrument. Most of the courses have 2 to 4 modules and each module has between 30 to 450 pages, typed double space using A4 paper. The modules were selected from 1986 to 1997 editions and printed at the Centre for Distance Education. All modules are in the first draft design stage and written by the course lecturers.

Evaluation results

Section A: Instructional design elements

1. Module writing rationale

Not all modules had rationale for writing modules. In module rationale five elements were evaluated. The results showed that all modules were found to be weak in the five elements. The two weakest elements were evaluation procedures (mean score 1.06) and reasons for writing module (mean score 1.42). A total of 49 modules (98%) were weak in explaining evaluation procedures and 43 (45%) were weak in providing reasons

Table 3: Module writing rationale (n = 50)

Rationale elements	*Mean score*
Evaluation procedures (eg, assignment, examination, grade, etc.)	1.06
Reasons for using modules	1.42
Overview of content and its relations to other modules	1.48
Target learners	1.52
Instructions to use module	1.84

for using modules. Table 3 shows the elements arranged in rank order from weaker to stronger element.

In this introductory element, it is important for students to know the evaluation weight, why they should use the modules and identify the relations between one module and another module. Module writers should also state the intended users. Although 9 modules were selected from modules 2, 3 or 4, the elements identified do not influence the overall result. This element has a group mean score of 1.48 (refer Tables 3 and 8).

2. Instructional goal
A total of 37 modules (74%) were weak in stating the instructional goals. The goals were stated at the beginning of a module. The goals need to be written briefly and in broad statement. Perhaps, the writers were confused between instructional goals and instructional objectives. They need to differentiate between instructional goals and instructional objectives.

3. Instructional objectives
All modules had instructional objectives. In instructional objectives, seven elements were evaluated. The result showed four elements were found to be weak: Using learning domain (mean score 1.88), using learning hierarchy (mean score 1.94), using terminal and subordinate objectives (mean score 1.98) and providing objectives to cover the whole module (mean score 2.38). A total of 44 modules (88%) were weak in using learning domains in instructional objectives as well as writing objectives according to learning hierarchies. However, 38 modules (76%) stated the objectives at the beginning of the modules. Table 4 shows the seven elements arranged in rank order from weaker to stronger element.

The weak elements in writing instructional objectives were:

a. Instructional objectives were not analysed according to learning domains
b. Instructional objectives were not arranged according to learning hierarchy that is from lower order skills/knowledge to higher order skills/knowledge based on Gagne's learning categories (1992) or Bloom's learning taxonomy (1956)

Table 4: Instructional objectives (n = 50)

	Instructional objective elements	*Mean score*
3.1	Objectives consist of cognitive, psychomotor and affective domains	1.88
3.2	Objectives are written according to learning hierarchy (lower level skills to higher level)	1.94
3.3	Objectives consist of terminal and subordinate objectives	1.98
3.4	Objectives cover the whole module	2.38
3.5	Objectives use appropriate performance verbs	2.56
3.6	Objectives are stated clearly and accurately	2.62
3.7	Objectives are stated at the beginning of a module	2.66

c. Instructional objectives were not arranged according to terminal and enabling/subordinate objectives
d. Instructional objectives did not cover the overall content.

The strong elements were:

a. Objectives used appropriate performance verbs
b. Objectives were stated clearly and accurately
c. Objectives were stated at the beginning of the modules.

4. Entry-level test

Entry-level tests were not included in any module. In module writing, the entry-level test will determine the pre-knowledge and skills that a learner should have to help or prepare him/her for the actual lesson.

5. Multimedia

Almost all modules did not integrate non-print media such as video, slide and audio-cassette in the learning sequence to support the print-based self-instructional module.

6. Learning activities

All modules had learning activities. In learning activities, 14 elements were evaluated. The results showed that 12 elements were found to be weak. The weak elements were:

a. Use of instructional strategies (mean score 1.28)
b. Selecting learning unit (mean score 1.52)
c. Use of learning domains (mean score 1.84)
d. Learner interaction with other learners (mean score 1.88)
e. Creating interest and motivation (mean score 1.92)
f. Providing feedback (mean score 2.04)
g. Providing clear instructions (mean score 2.08)
h. Arranging learning hierarchy (mean score 2.10)
i. Providing examples (mean score 2.12)
j. Providing other (in text) references (mean score 2.12)

Table 5: Learning activities (n = 50)

	Learning activities elements	*Mean score*
5.1	Use different instructional strategies (eg, discussion, simulation, cooperative learning)	1.28
5.2	Learners have the option to select learning unit	1.52
5.3	Learning activities consist of cognitive, psychomotor and affective domains	1.84
5.4	Learner interacts with other learner (through module instruction)	1.88
5.5	Able to get learners' interest and motivation	1.92
5.6	Feedback (in the form of answers) are provided	2.04
5.7	Instructions are clear	2.08
5.8	Learning activities are arranged according to the learning hierarchy	2.10
5.9	Examples and learning guidelines are provided	2.12
5.10	Other reference materials are provided	2.12
5.11	Learners interact with learning materials (through user-friendly language and feedback)	2.18
5.12	Follow-up activities (eg, assignments, project, etc.) are provided	2.30
5.13	Exercises, tests and feedback are sufficient	2.50
5.14	A summary is given at the end of learning unit	2.54

k. Learner interactions with learning materials (mean score 2.18)
l. Providing follow-up activities (mean score 2.30)

The strong elements were:

a. Providing sufficient exercises and tests (mean score 2.50)
b. Providing summary at the end of learning unit (mean score 2.54)

A total of 49 (98%) modules were weak in applying instructional strategies in learning activities and 45 (90%) weak in providing options to select learning units. However, a total of 33 modules (66%) provided summaries at the end of the learning unit and 29 modules (58%) provided sufficient exercises, tests and feedback. Table 5 shows the 14 elements arranged in rank order from weaker to stronger element.

7. Self-tests

All modules included self-tests. Seven elements of self-tests were evaluated. The result showed that six elements were found to be weak. The weak elements were:

a. Using learning domains in self-tests
b. Providing examples and guided answers
c. Providing clear instructions
d. Providing tests according to learning objectives and module content
e. Using higher order and lower order skills in self-tests
f. Arranging tests from simple to complex questions.

The strong element is:

Self-tests were given at the end of every frame or learning unit.

Table 6: Self-test (n = 50)

	Self-test elements	*Mean score*
6.1	Tests consist of cognitive, psychomotor domain	1.92
6.2	Examples and guided answers are provided	1.94
6.3	Test instructions are clear	2.04
6.4	Test questions are based on the learning objectives and module content	2.14
6.5	Tests consist of higher and lower level skills and knowledge	2.18
6.6	Tests are arranged from simple to complex questions	2.30
6.7	Tests are given at the end of every frame or learning unit	2.52

A total of 45 modules (90%) were weak in using learning domains in self-tests and 36 modules (72%) weak in providing examples and guided answers in self-tests. However, a total of 31 modules (62%) provided self-tests at the end of every learning frame or unit. Table 6 shows the seven elements arranged in rank order from weaker to stronger element.

The data from the evaluation also indicated that tests and exercises provided within the text or at the end of the learning unit were not based on the learning objectives and test instructions were not clear. The self-tests were not arranged according to the sequence of the learning hierarchy beginning from the lower level skills/knowledge to higher levels. This element is also weak in the learning activities.

8. Post-test

No modules evaluated had a post-test at the end of the learning unit. The post-test would measure the learner's performance based on the learning objectives.

Section B: Technical design

1. References

No module followed a reference style such as American Psychological Association (APA) or Harvard style. No author and year reference is made in the text.

2. Layout

All modules were right justified. The texts used double spacing. There was enough space to do exercises and to read.

3. Module format

In the module format, nine elements were evaluated. The results showed that five elements were found to be weak. The weak elements were:

a. Author/subject index not included
b. Glossary/terms not included
c. Dedication page not included
d. Preface page not included
e. Figures, diagrams or appendices pages not included.

The strong elements were:

a. Contents page included
b. Copyright page included
c. Cover page included
d. Author and title pages included.

A total of 49 modules (98%) were weak in providing author/subject index, glossary/terms index and dedication page. However, 48 modules (96%) had author title and cover page. Table 7 shows the nine elements arranged in rank order from weaker to stronger element.

The technical elements from 1.6 to 1.9 in Table 7 are quite strong since the Centre has a standard house style or format to write the modules. Elements 1.1 to 1.5 are weak because writers have to prepare them. Furthermore, these elements are not included in the house style except element 1.4 (see Table 1).

4. Lettering
All modules used a standard font type (Times), point size (10–12 point) and text and heading spacing. Font size 18 point, boldface type upper case was used for main headings, 14 point, boldface type lower case for small headings and 10–12 point for text. For the main headings, upper case was used throughout. It is recommended that headings which have less than 5 words may be written in upper case.

5. Graphics
The diagrams and figures are in black and white and were found to be suitable in terms of position, balance and rule of the third. No module used colour diagrams or illustrations.

6. Audio
No module integrated the audio element.

7. Visuals
No module integrated still or motion pictures.

Table 7: Module format (n = 50)

	Module format elements	*Mean score*
1.1	Author/subject index included	1.06
1.2	Glossary/terms included	1.08
1.3	Dedication page included	1.14
1.4	Preface page included	1.48
1.5	Figures, diagrams or appendices pages included	1.62
1.6	Contents page included	2.58
1.7	Copyright page included	2.94
1.8	Cover page included	3.30
1.9	Author and title pages included	3.42

Table 8: Overall mean score for ID and technical elements

ID components	*Mean score*
Instructional objectives	2.29
Self-test	2.25
Technical format	2.06
Learning activities	2.03
Instructional goal	1.76
Rationale	1.48
Multimedia integration	0.00
Pre-test	0.00
Post-test	0.00

Overall ID and technical design results

The overall results showed that all main ID and technical elements were weak. The group mean score for the ID and technical elements is presented in Table 8. The mean score is arranged in rank order from the highest to the lowest score. The weak elements are the post-test, pre-test and multimedia elements which have a mean score of 0 each. The strong elements are the instructional objectives and self-test which have a mean score of 2.29 and 2.38, respectively.

Discussions

The findings from the module evaluation showed that the following design elements were weak and need improvement. The elements are arranged in rank order from weaker to stronger element:

1. Post-test element
2. Pre-test element
3. Multimedia integration
4. Module rationale
5. Instructional goal
6. Learning activities
7. Self-test
8. Instructional objectives.

Pre-test and post-test

No module included post-test and pre-test. These elements are not included in the standard house style set by the Centre (see Table 1). However, most modules have included self-tests which is in the Centre's house style. The house style serves as a guideline for module writers to follow. The module writers may feel that self-tests are sufficient to measure learners' achievement. They assume learners may have the necessary pre-knowledge before entering the lesson. A study should be conducted on the importance of pre-test or post-test in module writing.

The post-test would measure learners' performance based on the learning objectives. The pre-test would prepare learners for the new learning unit. It provides an overview

of the whole lesson. The learner may also compare his/her performance in the post-test with his/her previous performance in the entry-level test. Since distance learners learn without the teacher, the module, being self-instructional, takes the responsibility of providing entry-level test and post-test.

Multimedia materials
The evaluation indicated that most of the modules did not integrate non-print media (multimedia) to support the print-based module. This element is also not included in the Centre's house style. Developing multimedia such as slides, videos, audio and computer-based materials requires skills and knowledge in photography, production techniques, computer graphics, computer authoring, internet and instructional design. Are course lecturers required to develop multimedia materials besides writing printed modules and teaching the course as well?

At this Centre, modules are usually designed and written by course lecturers. In this study, one or two course lecturers may write a module. To develop multimedia materials requires a team consisting of instructional designer, subject specialist, production specialist and computer experts. Many studies have indicated that teachers are overburdened with normal teaching load.

The question is could print-based materials alone accommodate the learning styles of all distance learners? Learning can be effective if the various senses are exploited through the use of different media. If other media (or medium) are needed, the module writer should know how to select or adapt the right kind of media. He/she may need the help of an instructional designer or media specialist to advise him/her to select and use the most appropriate media to support the printed module. Regional centres may be used as resource centres where lecturers and distance learners can have access to various learning and training materials and equipment to support the printed module.

Rationale for module writing
The findings indicated most module writers did not identify the users, explain why they should use the modules, explain the evaluation format or provide an overview of the whole course. Perhaps the information may have been included in the guidebook or academic plan. The findings help to standardise the information in the introductory module and coordinate all information in the guidebook, academic plan and module 1.

Instructional goal
A good module should state instructional goal(s) at the beginning of the module. Many ID models include instructional goal as one of the core elements in instructional design (Richey, 1986). Writers also need to differentiate between instructional goals and learning objectives. In this study, the writers were confused between instructional goals and instructional objectives. Perhaps a short course on writing instructional goals may help course writers to write clear and precise instructional goals.

Learning activities
The study reveals that most of the elements in the learning activities are weak and need improvement. There is no guideline on what, when and how to include learning activities in the module. Course writers need to know the various instructional strategies and techniques and the appropriate technologies that are suitable for distance education. Jonassen (1995) proposed that constructivism combined with learning technologies may be applied in distance education.

Another important element is interaction: interaction with learners, interaction with materials and interaction between learner and learner (Moore, 1991). The module seems to indicate that learning activities neglected these interactions. Adult learners being separated from the teacher need these interactions, whether in modules in the form of simulated dialogue written in more friendly language (Holmberg, 1977) or real-time discussion and knowledge construction as in cooperative learning and situated learning. In-text questions as a form of eliciting feedback may be used for knowledge construction.

Module writers also seem to put less importance on providing answers and guided examples in their modules. Perhaps some guidelines on how to integrate learning activities to make the module a self-standing learning material should be provided. Some of Gagne's instructional events (1992) can be adapted in the learning activities.

Self-test
All modules included self-test. This element is listed in the Centre's house style. The self-tests are prepared to measure learners' progress in stages based on the content and learning objectives. However, the findings indicated that module writers are weak in writing good self-tests. They need courses on test construction based on different learning domains and learning hierarchy.

Learning objectives
This is the most important ID component in the development of a module. The results indicated that all modules have instructional objectives. This element is listed in the Centre's house style. Most module writers were able to write the learning objectives clearly and accurately. However, they need to arrange the objectives hierarchically and to classify them according to learning domains. Courses on learning domains, learning outcomes and learning hierarchy may help course writers to write better instructional objectives.

Section B: Technical design
The results of the evaluation show that almost all the modules have the technical elements. The modules follow the standard or house style recommended by the Centre. However, there are certain technical elements that need to be included in the module such as author index, subject index and glossary/terms. All modules are right justified. According to Rubens and Krull (1985) and Hooper and Hannafin (1986), texts that are right justified are slow to read.

The standard format/house style prepared by the Centre needs to be expanded to cover the colour print module and non-print media. The technical elements such as colour selection and contrast, audio, visual and graphics need to be standardised according to instructional graphic principles.

This study has several limitations. The modules were developed and evaluated by the researcher himself. The findings may reflect the opinion of the researcher. Perhaps more instructional designers from the Centre should be involved in the evaluation. However, the modules selected were based on the three degree programmes offered, the period covered (1986–1997) and the kind of module selected (module 1).

In this study, different levels of responses in the ID elements were expected because the module writers were varied in terms of experience, training and knowledge about module writing. Perhaps a more stratified sampling based on these variables may be considered for future evaluation.

The researcher also assumes that modules selected have all the ID elements needed in module writing. The house style or guideline recommended by the Centre should include all elements needed to write a good self-instructional module.

Recommendations

On the basis of the study it seems reasonable to draw several recommendations to help improve the quality of the modules and to make suggestions for future research in writing self-instructional modules for the distance education programme.

1. The rationale for writing modules needs improvement. Writers should identify the intended users, entry-level characteristics, the evaluation procedure, instructions for use of modules, distance learning strategies and the recommended study hours. Sharifah and Karsono (1988) suggested that a distance learner in the Science Foundation course needs an average of 2.7 hours a day.
2. The modules need to have more self-tests with answers and enough examples to make distance learning more active and effective. Baath (1980) believes that if the modules provide enough tests or exercises, learners may not need to send assignments to be graded by the course teacher.
3. The module should be more interactive. In distance learning, interaction is important. Moore (1991) identified three kinds of interactions in distance learning: a) between teacher and learner, b) between learner and learner and c) between learner and learning materials.
4. The modules should be in user-friendly language. It should suggest teaching rather than informing. In other words, there must be two-way communication. In module writing, there must be an element of guided didactic conversation that can create warmth, closeness and two-way communication between learner and materials or learner and module writer (Holmberg, 1977).
5. Multimedia or non-print media needs to be integrated with the print-based instructional module. The use of varieties of media can accommodate the different learning

styles. Regional centres may be used as resource centres to assist the process of multimedia application and integration in distance learning. The Centre should form a course team to produce multimedia materials.

6. The module writers need training on learning theories, instructional design and development, media selection, media attributes, multimedia production, media integration, utilisation and management in distance and open learning.
7. The Centre needs to have a standard guideline for module writing. The standard or house style prepared by the Centre needs to be expanded to include the technical elements of non-print media. The Centre may use the standard to evaluate the printed modules or web-based hypertext/hypermedia materials.
8. Distance learners may use the instruments developed to identify the elements of a good self-instructional module.
9. A study should also be conducted on the conflicting roles of module writer, instructional designer, media specialist and course lecturer. Do these roles have implications on workload and quality of module writing?
10. Future research should also discuss more extensively the types of instructional strategies suitable for print-based self-instructional modules.

Conclusion

In this paper, I have discussed the elements and principles of instructional design in module writing and suggest some recommendations to improve the quality of instructional modules used in the distance education programme. The evaluation can help the module writers and the distance learning operators to check and review the existing modules based on the principles of instructional and technical design. Nevertheless, a good instructional module needs to be evaluated periodically not only by the instructional designer but by the users and subject specialists as well.

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