Resource Package on Coursework Assessment of the S4-5 Computer and Information Technology Curriculum

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List of Abbreviations

CDI	Curriculum Development Institute
CIT	Computer and Information Technology
EMB	Education and Manpower Bureau
EMI	English as Medium of Instruction
HKCEE	Hong Kong Certificate of Education Examination
HKEA	Hong Kong Examinations Authority
HKEAA	Hong Kong Examinations and Assessment Authority
HKU	University of Hong Kong
PCEd	Postgraduate Certificate in Education
TAS	Teacher Assessment Scheme

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Chapter 1
Introduction

In the past two decades, the term *Information Technology* has become more fashionable than *Computer Science*. In the past, when a student said that he was studying *Computer Studies*, the image of writing computer programs in front of a machine with computer printouts scattered untidily on a workbench would come into people's minds. Programming is not an obsolete entity; it is still involved in many different applications of *Information Technology* and has evolved as one of the many domains of the wider application of computers. Nowadays, a student studying *Information Technology* or computer-related courses will mention phrases like multimedia streaming broadcast, HTML, networked computers, etc.

People from all walks of life would agree that practical experiences, besides theoretical understanding, are essential components in today's *Computer Studies* or *Information Technology* curricula. Strong communication skills are also required in the meaningful application of software, hardware or multimedia technology. Besides, the mounting tension from ethical issues due to the widespread use of computer and information technology demands the attention of curriculum developers and teachers.

Likewise, it is now generally agreed that the level of computer and information technology a student has learnt can only be assessed to a certain extent by paper-and-pencil tests. Mastery of practical skills is more accurately reflected in the processes taken to accomplish a task or to produce a product with the use of computer or information technology that takes a long period of time. Whether a student has developed an appropriate attitude towards the use of computer and information technology and has an awareness of ethical issues is even more difficult to assess by paper-and-pencil tests. Therefore, in order to assess a student who has studied *Computer Studies* or *Information Technology* in a more comprehensive way, an assessment instrument that is formative rather than summative is required. In this regard, project work, authentic tasks and portfolio are suitable means of formative assessment. In fact, formative assessment with quality feedback from teachers, as demonstrated in much research, serves not only as an assessment instrument but also enhances the effectiveness of students' learning, i.e. assessment for learning.

The *S4-5 Computer and Information Technology* (CIT) curriculum published in 2003 by the CDI and HKEAA introduced coursework assessment and this move is a leap from the sole use of an end-of-course examination to a combination of summative and formative assessments. It is hoped that the coursework can allow more dimensions to be assessed other than those by paper-and-pencil tests.

However, there are many different aspects of coursework assessment that teachers showed apprehension in the course of development. Examples include:

- Whether coursework in the format of project work, authentic tasks, or portfolio really fosters active learning
- How to maintain fairness among schools and students
- How to guide students go through the coursework for so many months
- How to play the role as a teacher and an assessor at the same time
- How to tackle cheating
- How to mark or grade coursework
- How to moderate the standards between schools
- etc…

The above are just a few concerns of teachers in a list which is not exhaustive. In this connection, workshops were run for teachers to mark sample coursework scripts, and to exchange views on different issues which may arise when coursework assessment is implemented. A more fundamental problem however remains that, in Hong Kong, "the examination tail is used to wagging the learning dog". How this coursework can be implemented to turn it the other way round is highly desirable, but something not easily achieved. This demands the concerted effort and shared professional understanding of teachers.

This resource package is a dossier of sample coursework, with annotations (denoted by ) in the pdf files on the CD-ROM, of the four elective modules of the *S4-5 Computer and Information Technology* (CIT) curriculum. The samples are indexed and numbered according to the following scheme:

P stands for Module A "Algorithm and **P**rogramming"
C stands for Module B "Organisation of **C**omputer"
N stands for Module C "Data communications and **N**etworking"
MM stands for Module D "**M**ultimedia Production and Web Authoring"

The numbers **1**/**2**/**3** … after the letters **P**/**C**/**N**/**MM** represent the 1st, 2nd, 3rd, … entries. Views of the over 700 participating teachers in the workshops towards the sample coursework, plus their own sharing on many other controversial issues as well as recommendations to teachers on certain aspects are also included. Since the trial run of the

sample coursework was carried out by students from EMI schools, almost all sample coursework indexed as **P**, **C** and **N** were attempted in English. The language used remains intact and the content was not polished so as to keep the original facets of the coursework.

It is hoped that through the collection and documentation of the sample scripts and teachers' views about coursework assessment, teachers teaching the *S4-5 Computer and Information Technology* (CIT) curriculum, or those who will be teaching it, can have some ideas about how to plan for, conduct and improve their own assessment in delivering the curriculum. The ideas expressed in this assessment package and the collected materials here are by no means perfect. They are intended for stimulating reflection and professional dialogue.

Chapter 2
General Issues on CIT Coursework

2.1 Chapter Overview

This chapter outlines the general issues discussed in the numerous training workshops for the CIT curriculum that were run from January to July 2003. In all the workshops, we hope to act as a bridge to bring people's thoughts and experiences together, and we believe that the ideas generated from these workshops can help to shape the rules of practice of the CIT coursework and its assessment. An outline of the general issues discussed and ideas shared in this chapter helps teachers to recapture the essence of the curriculum and assessment change and allow more people to reflect and build upon the current achievement.
In the workshops, teachers filled in questionnaires to express their common and different views, and in order to facilitate discussion, we presented teachers with

- different drafts of assessment guideline (or marking schemes), and
- different samples of coursework from students.

Through comparing different samples of students' work and discussing them, teachers exchanged ideas as to how they viewed or understood the purposes and expectations of the CIT coursework. A lot of important issues in the teaching and assessment of the CIT coursework were brought to surface, and the discussion amongst teachers deepened their understanding about these issues. In the end, we believe that teacher awareness of these important issues is of paramount importance, because it is only with such awareness that teachers will be able to interpret policy or procedural documents appropriately and to implement them for the maximum benefit of their students.

The discussion also generated a number of useful strategies that teachers could consider using in their own teaching and assessment of the CIT coursework, as well as some useful ideas for examiners or the examination authority. These strategies and ideas will be elaborated whenever appropriate in the text and chapters that follow.

As mentioned earlier, besides the discussion, teachers who participated in the workshops were asked to fill in a questionnaire at the beginning of the workshop. The questionnaire is constructed in a way to assess whether teachers agreed or disagreed with certain claims about coursework assessment on a five-point scale. From the survey, we found there can be much consensus[1], as well as many areas of disagreement and uncertainty[2] amongst teachers.

[1] Where (mean + standard deviation) and (mean – standard deviation) are pretty much on one side of the scale.

We shall report our observations which include important issues in the teaching and assessment of the CIT coursework and the majority views or common understandings we perceived amongst teachers. In the case where a strong split in opinions amongst teachers was perceived, that shall also be acknowledged.

2.2 Teachers' General Views towards the Introduction of CIT Coursework

First of all, there was a general agreement amongst teachers on the positive effects of CIT coursework which included:

- The coursework can foster students' active learning and sense of ownership.
- Students will learn to look for useful information themselves.
- Students will generally develop a deeper understanding through coursework.
- Teachers will also gain new knowledge through the coursework.

However, most teachers also thought that students would generally be slow in their progress. Many students would find the coursework difficult to handle, and would need the help from their teachers. Teachers generally also had some worries about the increase in workload.

Teachers generally agreed with the following ideas about the guidance of coursework:

- To teach systematically the basic skills and concepts relevant to the coursework first.
- To show students how to do a similar project in a different area before they ask the students to work on the project required.
- To help structuring the coursework into several stages (e.g. formulating objectives, doing analysis, putting up the design, and so on), and requiring students to hand in interim reports.

At the same time, they generally agreed that teachers should leave room for students to try out their own ideas:

- Teachers see their role primarily as assisting the students to do the best that they can.
- Teachers will assign certain regular lessons for students to do the coursework in class.
- In these lessons, teachers can discuss with students the general directions of the coursework and innovative ideas in order to motivate the students.

[2] Where (mean + standard deviation) and (mean – standard deviation) extend widely across the two sides of the scale.

- Teachers will encourage students to try on their own first before asking the teachers for help.
- Teachers are not to/will not directly tell students what to do.

These findings suggested that teachers in general accepted the introduction of the CIT coursework as a positive move, and they were thinking about how to give appropriate guidance according to the ability and needs of their students, so as to bring about effective learning through the coursework.

However, the survey also exposed some issues of confusion amongst teachers in several areas which will be discussed in the subsequent sections. They include:

- Conflict between teaching and assessing (the issue of fairness)
- Assessment criteria and inter-school variability
- Variability among coursework related to different elective modules
- Plagiarism or differentiating between appropriate use of third party information and inappropriate copying

2.3 Conflict between Teaching and Assessing (the Issue of Fairness)

The survey indicated that the majority of teachers agreed to the statements like "*I feel some conflict in the role of a teacher: both in supporting and assessing students*" and "*I am not sure about the expected independent competence of students*(i.e. to what extent are students expected to be able to do things alone, such as in the public examination, without any help from teachers)."

The survey however indicated a wide variation of responses amongst teachers, from AGREEING to DISAGREEING, in the following statements:

- *I worry that I may act unfairly in giving them too much help.*
- *Even if I have a good innovative idea about the coursework, I shall not tell the students because it is like cheating.*
- *If the student asks me how to do something, I shall only give him/her a hint.*
- *If I have told one student something, I have to tell others in the class so as to be fair.*

There did not appear to be a consensus amongst teachers as to how much they should teach, or how much assistance they should give. They were also not certain about how much they should do in the induction of students into solving the problem given by the HKEAA.

Responses towards the following statements also varied widely from AGREEING to DISAGREEING:

- *I think it is fine that I tell the students the method and they do the job; as long as they experience doing the job and learn*
- *I shall teach students how to do the basic parts of the coursework required and leave them to do the enhancement*

Teachers were also not sure about how much they could do in correcting students. They generally agreed that if they saw a mistake in a student's work they should tell him/her that there was a mistake. But they showed a great variance, spreading widely from AGREEING and DISAGREEING, towards the statement "*If s/he fails to correct the mistake, I shall tell him/her how to make the correction*".

The core to all these questions is the tension between the conflicting roles of the teacher in being the teacher and the assessor at the same time. In the conventional practice, teachers has to care about teaching only, so they do all they can to help students to learn and to perform their best in their public examinations. But now, teachers, if seeing themselves primarily taking on the role of the examiner of a public examination, would naturally take fairness amongst students as highly important in their consideration, and become very cautious about giving assistance to students (or giving unequal amounts of assistance to different students.).

We think that resolving this issue is of paramount importance. Otherwise, the assessment side of the coursework may make classroom teaching and learning interactions during coursework very rigid. The teachers participating in the workshops discussed this finding of the survey. One imaginative case in the context of a sixth form TAS session was given to stimulate discussion:

Student: *Dear Miss Chan, I wish to ask a question. But before I ask the question, can you tell me whether you will deduct my marks because of asking the question?*
Miss Chan: *You ask first, and then I will tell you whether I shall deduct marks.*
Student: *In that case I think I shall not ask the question.*

(The case is adapted from a research by Dr Benny H.W. Yung, Faculty of Education, University of Hong Kong, to whom we wish to express our gratitude.)

Teachers generally felt that the coursework lesson should not be seen like TAS sessions. The argument from one teacher was particularly powerful. He said, "*If the teacher does not teach, then s/he can be FAIR ACROSS to all the students (all students receive equal*

treatment). However, if we are looking at the relationship between this teacher and the group of students s/he teaches, then it is actually very UNFAIR TO ALL of the students, because the teacher is supposed to teach the students and the time students spend in school should be for learning and not for examination."

Other teachers also pointed out, "*What the curriculum wants to achieve is assessment **FOR** learning, i.e. something to promote learning. Asking questions is part of the student's learning, so the student should not be penalized for asking questions, even if we do not consider awarding it.*"

One teacher mentioned a case he knew: *An Information Technology subject teacher decided not to show their students how to do things, but made an arrangement so that the students could go to the laboratory technician as their technical clinic*. This case stimulated a lot of discussion, and people soon became aware of the fact that even if the teacher did not teach, there would be a lot of other parties, like parents, siblings, private tutors, publishers, and so on willing to teach the students. It could be even more unfair if the teacher did not teach. It is reasonable to believe that the professional teacher should be able to distinguish between "*teaching their students to do something*" and "*doing the thing for them*", more so than the other parties.

In this regard, teachers' provision of leading questions and innovative ideas that stimulate students to think more deeply and more creatively about the coursework should not be seen as cheating. Helping students to understand and correct their errors is also a very important part of their learning, and teachers' input is valuable. At the same time, with due respect to the principle of active learning in coursework, it would be advisable that teachers should provide, as much as possible, a variety of examples for students to compare and contrast, or provide alternatives for students to make their own decision of choice, rather than making students simply model what the teacher did. Besides, most teachers agreed that they would "*teach students how to correct but they must do the actual process of correction themselves*" as stated in one of the questionnaire items.

A consensus about the major orientation emerged clearly from the teachers' discussion: *It is of paramount importance to see the coursework process primarily as a learning process and not as an examination process. Imagine that you were supervising a normal project/practical session, which was not for public examination, then you would naturally do the thing you thought would best benefit the learning of your students. You would not mechanically stop yourself from giving hints or discussing with students their difficulties. You would certainly not mechanically repeat everything you said to one student to all the other students in the class. If you thought it was something important that you had overlooked in the whole class*

teaching, and you realized that when one student asked you about it during the group work or practical time, you naturally would like to talk to the whole class about it. However, if you thought that what the student asked was too particular or complicated, with no relevance to the others in the class, you would not bother the whole class about it.

Underlying this is also a judgment about the learning objectives of coursework set in relation to the characteristics of the group of students. The colleagues teaching the subject in the school would have to agree on a basic level of expectation for their students. Based on that, the teachers could plan to teach such that the students would generally be able to do the basics of the coursework, while leaving them enough room for further exploration and enhancement. Then for those students who are weak and have difficulty in reaching that basic expectation, teachers may need to provide more help; and for those who are more capable, teachers may urge them to explore more things by themselves. This is what a sensible teacher would do and should not be seen as unfair practice. Of course, some sort of uniformity should still be maintained in order to give everyone a fair chance, for example the setting up of a deadline, so that any draft reports handed in by anybody in time will get some comments for improvement.

2.4 The Assessment Criteria

The teachers in the workshops were presented with the following assessment guidelines, and discussed their strengths and limitations if they were to be used for assessing CIT coursework:

- The assessment criteria used in the Information Technology subject, which provides a framework comprised of eight major aspects, namely *Objective, Analysis, Design, Implementation, Testing and Evaluation, Conclusion, Quality of Documentation, and Creativity*[3].
- The draft assessment guideline of CIT coursework issued by HKEAA (issued to schools together with the CIT curriculum consultation documents), which follows the 8-aspect framework used for the Information Technology subject, with the addition of level descriptors.
- Another draft assessment guideline of CIT coursework created for the training workshops and basing on the comments collected from PC Ed part-time and full-time students after they have used the HKEAA's draft assessment guideline in marking some coursework

[3] These eight aspects are revised in the two assessment worksheet samples published by the HKEAA in April 2004.

samples. This draft tries to include more sub-items under each aspect for teachers to choose/modify or to suit the particular type[4] of question[5] of the coursework.

The questionnaires returned indicated some rather common perceptions amongst teachers:

- They liked to do the scoring more objectively, based on a detailed marking scheme.
- They thought teachers in schools should follow several fixed broad aspects with given weightings in marking the coursework.
- There should be detailed sub-items under each aspect indicating what the aspect meant.
- They would like to see the assessment criteria created specifically for each particular question.
- They wanted to let students know the marking scheme before they proceed on with their coursework.

Teachers further clarified these views during the discussion:

- On the one hand, they wanted to let students know the marking scheme before they did their coursework, because they thought it would be fairer to the students.
- On the other hand, they also saw the need to make modifications in the wording and organisation so that what the student received was not the detailed scheme for giving marks, like 1 mark for this and 1 mark for that, but rather an indication of the directions or areas they should pay attention to and try to do their best in.

Teachers generally thought that the sub-items given in the draft assessment guidelines were useful, but teachers in a school should be empowered to draw up their own list for their students. They could select the items most relevant to their students and to the specific coursework question in hand. Some teachers expressed the thought that it might be unrealistic or scary to students if all of the sub-items were included. The teachers could choose certain foci and organize the sub-items together around a few questions. It would also be better that the list of sub-items or rephrased questions given to the students was expressed in a more concrete and contextual manner so that it would be understandable to the students. For example, "*understanding of the context of use and the user requirements*" would sound much more difficult to understand than "*Imagine in what situations are the users going to use this bus information kiosk? What are the things they should know? Or, what are the things they don't know and would like to find out? What are the other things that need to be considered?…*"

[4] Type of question refers to the different nature of elective modules, such as some require a report only while others require both a report and a product.

[5] Question of the coursework means the coursework title published by the HKEAA in April 2004.

While the level descriptors given in the HKEAA draft guideline provide additional cues about what a particular aspect means, teachers thought that the difference amongst words like "*brief*", "*complete*", "*clear, accurate and reasonable*" was difficult to define in a priori manner. It would usually be the time when the coursework on a certain question was done or partially done, that based on the variation amongst students and the teacher's experience of their work, the teacher would be able to give more specific meanings to these qualifying adjectives. So it would not be too useful to let students know these level descriptors beforehand. The level descriptors can be useful at a later stage, when teachers sit together to mark a sample set of reports/products, because by then they will be able to identify more concrete features that differentiate "*brief*", "*complete*" and "*clear, accurate and reasonable*", and establish some common standards of judgment. The questionnaires returned also showed that teachers generally agreed that "*Teachers in a school should be allowed to collectively inspect samples of works submitted, before they finalize a consensus on their standards of scoring.*"

The teachers generally expected that students would need teacher's help in order to have steady progress in their work, or else they might put everything off until the deadline was really very near. In order to motivate students to work according to schedule, most teachers agreed it was a good idea to extend the assessment aspect on "*creativity*" in the HKEAA draft assessment guideline to include "*process behavior*" so that behaviors like handing in things on time, good self-initiative in searching for information on their own, and so on would be rewarded. Furthermore, some parts of the coursework such as the writing up of the "objectives" or "analysis" could be done like class work, or even as a test in regular lessons, after some preceding discussion had been made.

2.5 Inter-school Variability in Assessment Criteria

There were some discussions about inter-school variability. The question posed was "*Taking these adjectives as examples, should different schools interpret them differently, or should the interpretation be standardised?*"

The conclusion of the discussion was essentially like this: *As statistical moderation according to the performance of the students in the written paper was in place, there was in fact no need to force every school to give the same definition to a mark (e.g. 70 marks).* It can actually be seen as a good suggestion to allow different schools to have some variation in the standard for a mark. It gives schools some flexibility to make the maximal use of a wider range of marks to recognise the difference in effort and achievement amongst their own students. It would be very demoralizing if, because of a stringent standardisation, every student in a school, ranging from the most conscientious worker to the least, were cramped

into a narrow range of marks. Finally, from the perspective of assessment, it is also better to have a wider spread than a narrower one amongst the students in a school.

Teachers in the discussion generally agree that some variability among schools in contextualizing or adapting the questions posted by the HKEAA is highly desirable. Teachers in schools should be empowered to put the general question posted by the HKEAA into a more specific context that is more familiar and meaningful to the students. Teachers may also adapt the general question, like highlighting a certain focus, so that the students can do a more focused search of information and try to develop a slightly more in-depth understanding about the issue at hand (e.g. focusing on upgrading the computer system for a specific purpose).

This adaptation of the coursework question is also seen as necessary because it is envisaged that a lot of reference materials will be available on the market about the questions set by the HKEAA. Publishers and tutoring agents are likely to provide standard reference on the questions. It is important that teachers can modify the questions in certain ways so that students will not be able to simply take something off the shelf without the need to do any original thinking.

2.6 Variability among the Coursework related to Different Electives

There has been quite a lot of discussion about the differences between the coursework for the four different elective modules. The questionnaires returned indicated that it is the common view among teachers that

- they would be able to compare the quality of students' work on the same question (type) in a valid and fair way, but
- they DID NOT think they would be able to compare the quality of students' work on different questions (types) in a valid and fair way.

So they thought it was strongly desirable that they scored each type of coursework separately, and that the scores for these different types of coursework related to the different elective modules would be moderated separately.

Although teachers agreed that they could do adaptation to the sub-items under each of the 8 aspects to be assessed, in order to make the assessment scheme more relevant to the nature of the different kinds of coursework, they found that the weight distribution amongst the 8 aspects might require adjustment for the different types of coursework designed for the different modules.

For instance, in the original HKEAA draft assessment guideline, the weight distribution is as follows: *Objective* (10), *Analysis* (10), *Design* (10), *Implementation* (25), *Testing and Evaluation* (10), *Conclusion* (10), *Quality of Documentation* (10), *Creativity* (15)[6]. This may not be appropriate for coursework like proposing networking plans, which is primarily producing a design of the network plan instead of its implementation. If a uniform distribution of marks must be maintained across the 4 types of coursework, then one possibility is to distribute the marks in a less rigid way. For example, the *Objective* and *Analysis* may add up together to a certain percentage. Similarly, the *Design*, *Implementation* and *Testing* parts may add up to another percentage. Then according to the actual type of coursework, or the way that the particular question is asked, the proportion of marks given to the eight aspects can be suitably adjusted to give a reasonably fair assessment across all different modules.

There has been a lot of discussion about the relative importance of the "product" versus the "report". Teachers generally expressed the wish to add more practical experiences and an assessment component corresponding to them to the questions for *Computer Organisation* and *Networking*, so as to make them more comparable to the questions on *Programming* and *Multimedia Authoring*. Details of this will be left to the later chapters that focus on each elective area in turn.

2.7 Differentiating between Appropriate Use of Information and Resource and Inappropriate Copying

Teachers raised the concern that students might easily gain access to a lot of information related to their coursework through various sources. There was much difference among teachers from DISAGREEING to AGREEING with the statement in the questionnaire:

- *It is alright that a student copies somebody's work if s/he understands and acknowledges it*

Apparently, there is a necessity to distinguish between what is appropriate from what is inappropriate, and help the students to understand this in the first place.

To this end, it may be necessary that teachers highlight the learning purpose of the coursework first, and that each student has to account for certain usage of third party information or resources in terms of its effect on his/her coursework in the final report. If

[6] The weighting of these eight aspects are revised in the two assessment worksheet samples published by the HKEAA in April 2004.

the purpose of the coursework is the learning of logical thinking in program writing, then the copying of a program or a program segment that meets the user requirements (e.g. playing *Apple Chess*) will take away the need of the student to do the logical thinking and hence is clearly inappropriate. However, if the purpose is the appropriate use of certain effects in showing or linking information in a presentation, then the use of a third party's code segment, or picking an easy-to-use software tool to generate such effects would be seen as appropriate. It is necessary for teachers to explain to the student the purpose of the coursework in relation to the learning objectives of the associated elective module. In any event, proper acknowledgement of such usage is required, so that there should be no hiding of the use of third parties' information and resources. Furthermore some description about how the student builds on the existing resource is highly desirable.

Teachers raised another concern about how to handle the relationship between students. The questionnaires returned indicated that teachers generally DISAGREED with the statement that

- *I shall not let students see each others' work, otherwise they will copy and their work will be too alike.*

However, there was also much difference among teachers from DISAGREEING to AGREEING with the statement

- *I shall encourage students to learn from each other; and they will not copy.*

So this seems to be quite a dilemma for teachers. The discussion amongst teachers did not generate a clear solution to this. Yet a number of interesting suggestions were made:

- *Students can register their innovative ideas to the teacher before the ideas are shared with the whole class.*
- *Students can save copies of their work to the network on a regular basis to demonstrate the originality of their work.*
- *The teacher can organize sessions of sharing, or s/he can inspect the progress of students regularly during working sessions, so that students recognise that their teacher knows the progress of individuals. This may deter students from simply copying others' work and hoping that the teacher will not notice.*
- *Following a similar logic, it would be better that the teacher makes public as much as possible any third party reference that is available on the Web or through other channels, and encourages students to understand and build upon such resources in a positive way.*

Teachers also suggested that if time allows, students are required to present their work orally and to answer questions about their coursework on the spot. This would also deter mindless copying. But in the end, teachers admitted that it was in fact very difficult to find out whether something was really constructed and developed by a student if it is something so sophisticated but s/he could explain it clearly.

2.8 Conclusion

The discussion and survey in the workshops indicated that teachers generally expected to see positive effects from the coursework. At the same time some prominent issues have been discussed. To summarize:

- We see that the introduction of the CIT coursework indicates a major change in the assessment culture.
- It is of paramount importance to see this coursework process primarily as a learning process and not as an examination process.
- In this new model, the teachers have to take a lot more initiative in deciding what to do than in the past, and they should be empowered the knowledge, skills and the necessary authority to do so.

As mentioned earlier, there are benefits in allowing schools to adapt the questions posted by the HKEAA, as well as to produce their own detailed assessment guideline for students.

At the same time, there should be opportunities for teachers to know what other teachers are doing. As the coursework marks will be moderated according to the performance in the written examination, schools are not directly competing against each other in terms of the coursework. Hence we look forward to a lot of professional sharing amongst teachers from different schools, and we also hope that the professional teacher associations can play an active role in this, like their counterparts in other parts of the world.

More suggestions on coursework supervision at different stages of the coursework and its assessment will be given in the next chapter.

Chapter 3
Issues relating to CIT Coursework at Different Stages

3.1 Chapter Overview

This chapter is intended to guide teachers in leading coursework through different stages and to address issues that might be encountered at different stages. Views expressed and popular strategies suggested by the participants in the training workshop are reported, though some vary in popularity whilst some are in good consensus.

The following issues, in the sequential order of going through a coursework in different stages, will be discussed:

- Interpretation and selection of questions
- Planning
- Implementation
- Cheating
- Evaluation
- Report writing
- Marking

3.2 Interpretation of Questions and Selection of Questions

A student has to attempt coursework which is from the elective module that s/he has chosen in the written examination of the *HKCEE Computer and Information Technology*. The first stage is to interpret the coursework question(s) and, if choices are available, select a particular one to be attempted.

The majority of the teachers who participated in the training workshops showed apprehension about making conjectures about the requirements and the level of difficulty of the coursework out of those vaguely phrased sample coursework questions. They believed that any slight misinterpretation of the requirements and level of difficulty would mislead students, which in turn would result in coursework that failed to meet the HKEAA's expected standard, or even be rejected by the HKEAA. In terms of the cognitive or intellectual demand of the questions, teachers also expressed anxiety about inter-school variability because they thought that interpretation and selection of questions depended on the ability of students from different schools. A possible scenario brought up by teachers in the workshops is that students from schools which are of lower ability would complete coursework with lower

level of difficulty, thus raising the issues of fairness across schools. Teachers also expressed concern about whether there were a number of choices for questions within each module. They worried about the issues of plagiarism if choices were not available and that all students in Hong Kong taking an elective module would attempt the same coursework question.

Despite the concerns raised, participants in the workshops agree that teachers have a crucial role to play in interpreting and selecting a coursework question, whether or not there would be a number of choices on coursework within each module.

In one extreme, the teacher does not offer any guidance at all. The student is given a free hand to choose his own coursework and make his own judgment of the way forward in starting off the coursework. This approach, however, only works for a few students who are enthusiastic. Moreover, this approach requires the students to bear the risk of wasting a large amount of time in pursuing an unachievable coursework.

In the other extreme, the teacher dictates virtually everything. There are different factors that may lead a teacher to adopt this approach, such as the limitation of available resources, or s/he is compelled to ensure that students meet the baseline in the public assessment. This approach is less effective in fostering and maintaining the enthusiasm of students.

Between these two extremes, the teacher definitely has a facilitating role to play. The teacher can discuss coursework with students in ways such as interpreting the requirements of coursework, making conjectures about the degree of difficulty of each coursework if choices are available, or advising possible use of certain software/hardware. Based on the guidance of the teacher, a student should be encouraged to select an appropriate coursework which is achievable according to his own interest, aptitude and ability. An achievable coursework is one that can meet the basic requirements in the public assessment. Since the student is involved in the discussion on how to pursue and/or select a coursework, this certainly gives the student a greater sense of ownership, thus a greater incentive to carry out the coursework well.

Suppose several coursework questions are available within an elective module, and the reason for attempting a particular question is not required to be reported. When a student chooses an ambitious coursework question without consulting his/her teacher, the teacher should alert the student the risk of encountering obstacles that may not be resolved easily and that limited help will be offered by the teacher. Having said that, the teacher should also encourage students to choose a question which they think will provide an opportunity for creativity and self-directed learning.

3.3 Planning

Before making any start of the concrete work on the coursework, both the teacher and the student have to go through a stage of planning.

3.3.1 Template versus Seed Ideas

Frequently, a specification has to be drawn up which includes what kind of information needs to be collected and how to collect it first. To this end, there are several alternative ways to draw up the ultimate specification. The teacher can let the student think of the specification of the coursework first, and then give feedback accordingly. This works well with the more capable students. However, for the average or below-average students, the teacher may need to offer more help in mapping out the blueprint. This leads to a frequently asked question as "*How much guidance should a teacher give?*". Although this issue will be lingering on in the whole length of the coursework, it is particularly important at this stage.

One of the commonly asked questions is whether a teacher should prepare a template for students to follow. Though "*It depends*" is the cliché answer to this question, it really say something about several important factors that teachers may have come across or may need to consider. For instance, the teacher may find it more comfortable to prepare a template or framework and let the students follow because some students lack the ability in foreseeing what the final product looks like. Another reason is that the school does not possess a wide variety of software/hardware and the template can demonstrate or limit what the student can do to follow suit. The obvious undesirable effect of preparing template(s) for students is that they have a high propensity to follow the teacher's template and know nothing about the rationale behind the design, not to mention the effect of diminishing the opportunity for students to develop their creativity.

An approach which is conducive to students' learning is that, instead of preparing template(s), the teacher can present several seed ideas to the students and let them go through a thinking process. Seed ideas can be given in the form of:

- different scenarios of the coursework question
- different related examples
- gateways to different sources of information
- providing students with an evaluation of existing crude solutions

Students of average ability are likely to adapt teachers' seed ideas to generate a reasonable

specification of the coursework. And students of low ability or low incentive may simply adopt one of the seed ideas to draw up an achievable specification.

3.3.2 Collaboration among students

Though the coursework is supposed to be an individual one, some teachers may like to help students who attempt the same coursework to form a cell-group in order to brainstorm and share ideas. Through group discussion, which is in itself a learning process, students can learn more about the coursework such as the objectives, possible alternative solutions, etc. It should be noted that the sharing of ideas generated in group discussion should not be treated as cheating.

3.3.3 When to start?

Regarding the time for the commencement of coursework, the whole Secondary Four school year, the summer vacation that follows Secondary Four, and the beginning of the Secondary Five are all possible starting points. "*When to start?*" really depends on different factors, such as the ability of students perceived by the teacher, a particular coursework question, the sequence of teaching of an elective module, etc. In the case of the teacher wishing to train students the skills for doing a project and/or writing a report, the journey can begin as early as before the HKEAA releases the coursework questions. In another case of students attempting a coursework which requires site visits in order to collect data, then the summer vacation in between Secondary Four and Five may be a suitable starting point. deferring the start to the beginning of Secondary Five may help students to carry out the coursework along with the learning of an elective if the teacher follows the teaching sequence recommended in the *S4-5 Computer and Information Technology* curriculum guide.

In planning when to start, teachers may take into consideration how the coursework should be divided into stages and when to conduct interim assessments, as these are apparently inter-related issues.

3.3.4 Dividing into stages

The coursework is supposed to be done over a period of time and should not be rushed in the last month or even the last week. Teachers and students should agree on a reasonable schedule which lists out the different stages for attempting the coursework. This not only helps the students to have better time management, but also prevents the students from spending a disproportionate amount of time on certain stages; for example, dragging on in the case of encountering obstacles which then leads to insufficient time in writing the report. If a student decides to start in Secondary Four in year *200x*, a workable schedule can be suggested as follows:

January – April *200x*	Pre-training on report writing skills
May *200x*	Interpreting coursework questions and selecting a particular one to attempt
July – August *200x*	Data collection
September *200x*	Further discussion on the coursework question based on data collected during summer vacation
September – December *200x*	Implementation of the coursework product, and submission of interim product and report
January *200x+1*	Writing up of final report
End of January/February *200x+1*	Marking of coursework

3.3.5 Pre-training

Nowadays, many students have experience in carrying out large scale projects since project-based or problem-based learning has been promoted in lower forms. Yet, the teacher may prefer to do some pre-training by giving students mini-projects to accomplish before they actually start the coursework. In this kind of pre-training, the teacher believes that doing mini-projects allows students to learn setting up objectives, analysing problems, and designing solutions, etc. Sometimes it also involves training on report writing skills which may be one of the weakest abilities of Hong Kong students.

3.3.6 Knowing the assessment criteria

Another issue that may come into the teacher's mind before the students start any concrete work on the course is whether students should be given the assessment criteria/guideline, or even the marking scheme if there is one provided by the HKEAA. Unless there is clear instruction from the HKEAA prohibiting teachers from doing so, there is an unequivocal consensus amongst participating teachers in the workshops that students should know the assessment criteria/guideline before they start the coursework. It is because almost all of them believe that knowing the assessment criteria/guideline better equips the students to meet the criteria.

In fact, the name of the HKEAA assessment guideline explains itself; the guideline is only a *guideline*. Teachers should be empowered to modify and add descriptors. It is because one *universal* assessment guideline is not suited to serve assessment of the different elective modules. Besides, students may finish with a particular product with attributes which do not

exist in the universal guideline. Thus, both the teacher and the students, in the stage of drawing up specifications, can agree on a set of criteria before setting out the coursework. This not only lets the students know clearly the target(s). The involvement of the students in setting the assessment criteria is also part of the learning experience.

3.4 Implementation

Implementation is the essential stage where a student realizes his design. This presumably is the stage when a significant proportion of time will be spent.

3.4.1 Data/Information collection

Data or information collection is almost the first step in carrying out the actual coursework. There are various means to carry out the collection process, namely:

- reading books, magazines
- conducting Internet search, searching for the required information in CD-ROMs
- site visits
- etc.

However, students should be reminded of the issue of copyright. Evidence of asking permission to use copyrighted materials should be kept. Pieces of evidence, for example, printout of emails or other communication records between the student and the copyright owner, can be included into the report as appendix.

3.4.2 Keeping a log journal

If an agreed schedule is made between the teacher and the student, then the habit of recording onto a log journal is worth developing because time management is one of the skills that needs to be developed by students. A teacher can sign against each completed stage if the student can show evidence of finished parts. The log journal can then be added to the report as evidence of going through a development process.

Besides keeping dates of work, the log journal serves as a tool to record anything that has been considered during the analysis, design, implementation, evaluation and testing stages. When the student starts writing up the report, reading the journal is a means of recalling the details of those processes, and this definitely will aid the report writing.

3.4.3 Use of Resources

Regarding the use of resources in implementing the coursework, teachers may have two

concerns. One is in a situation where the student decides, after serious consideration of alternatives, that a particular software/hardware best fits his design and implementation, but the school lacks such an item. This has to be dealt with in the planning stage in which the teacher should let the student know the limitations first. The student then has to think of his design within the scope since not every coursework has to be tackled with sophisticated tools.

Another predicament that a teacher may have to face is that the teacher is not familiar with a tool, either a piece of software or a hardware, that has been selected by the student. It is quite natural that a student will choose a tool that s/he is confident in using. Even if the student is stuck with the tool, s/he can always explore the "*Help*" menu /manual provided by the tool. A teacher does not need to know the tool inside out. This is because a teacher is expected to offer general guidance and not to give specific technical information to help the student. Using a sophisticated tool is not a must, and the student should be encouraged to use tools or other resources available from the school that can serve the purpose. If the student needs a tool which is not available in school, then both the student and the teacher can explore the alternative tools.

3.4.4 Use of lesson time

The coursework, a kind of school-based assessment, is not allowed to be taken home for implementation and refinement in certain overseas countries. Students have to work out the coursework in class as time has been allocated. In Hong Kong, this may not be feasible given the tight schedule of the curriculum. In the *S4-5 Computer and Information Technology* curriculum, the stated contact hours of 10 hours is certainly inadequate for a student to complete the coursework in class. They are for encouraging interaction between teachers and students. Teachers can set aside certain contact hours to discuss the coursework with the whole class at each stage and review the progress. This is because students attempting the same coursework may encounter similar obstacles and difficulties. Thus, teachers can take this opportunity to discuss those common problems with students and the discussion again is part of the learning process.

3.4.5 Interim assessment

The actual going through the process is essential to coursework. Teachers may wish to allocate a certain score as "process mark" and require students to submit parts of the coursework at different stages for assessment. Teachers may also simply wish to ensure that students are really doing the coursework on their own at each stage.

Teachers may request that students present their work, which may be parts of the product or report, at regular intervals so as to facilitate assessment for learning. Teachers can seize this

opportunity to give feedback on the performance currently achieved. Such interim assessment serves to:

- let students know whether they are heading towards the right direction
- let students know whether their pace is appropriate
- let students know whether any parts need to be strengthened
- encourage students to reach the highest level of attainment that they are capable of

Teachers, however, have to be careful about giving feedback on the coursework or report. Inappropriate wording not only offers little help for learning, but may also lead to unfairness. The following example contrasts the way of giving feedback in a guidance tone with one that explicitly tells the student what exactly should be done.

✓ Appropriate – "*Explain why you chose **Access***"

✗ Inappropriate – "*Include in the report '**Access** allows me to handle large amounts of data', use your tables **student.mdb** and **library.mdb** to show that **Access** works well with large amounts of data*"

3.4.6 Teacher intervention

From time to time, students may encounter obstacles and will seek help from different sources. Though students should be encouraged to look for information themselves, such as from the Internet, books, etc., more often they will approach their teacher for help. Strictly speaking, there are two types of help-seekers: (1) those who are truly stuck in part of the coursework and cannot move forward without help; and (2) those who incline to rely heavily on their teacher. In the first place, offering assistance is an acceptable practice since the teacher has the role of facilitator to play, particularly when the stage of concluding assessment has not yet arrived. Secondly and in most cases, it is not difficult for a teacher to make a professional judgment in deciding how much help should be offered and in what ways. Giving directional guidance, rather than doing things for the student, is more important.

Very often, the issue of "*teacher intervention*" and "*student's dependency*" leads to another bigger issue, that is "*cheating*".

3.5 Cheating

3.5.1 Kinds of cheating

"*The coursework being too difficult*", "*the need to pass or achieve a high grade in the*

coursework", "*a sense of meaninglessness in doing coursework*", etc. are some possible reasons why a student attempts to cheat in the coursework; and the list is not exhaustive.

Plagiarism and having the coursework done for the student by a third party are the two main types of cheating. Plagiarism can be categorized as "*copying external resources without acknowledgement*" or "*copying another student's work*". Having the coursework done for the student by a third party such as peers, parents and siblings, or an expert is another form of cheating. Some students may even pay for coursework tailor-made by private bodies such as or tutorial agents.

With the widespread use of information technology, copying external resources without acknowledgement is very tempting to students. This can be done easily with just two keystrokes in the Windows environment. Besides, teachers may find it difficult to prove that a student has copied from a particular source even if the case is highly suspicious.

Sometimes, plagiarism is difficult to be discovered because it is rare that a student submits a piece of coursework without any modification. A student who is smart enough will always make enhancements and improvement to the work s/he has copied when it is from another student in the same school. In the worst case, a student may even submit a coursework copied from a student of another school attempting the same coursework.

Many teachers agree that it is equally difficult to prove whether the coursework submitted was done by a third party, especially if the third party has provided only the essence of the coursework to a student.

3.5.2 Deterring cheating

Unless a student honestly admits that s/he has committed cheating, it is a hard and unpleasant job for a teacher to prove it. So, taking preventive measures is more effective.

On the one hand, a teacher can emphasize the culture of honesty, which includes self-respect and being proud of the coursework accomplished by the student on his/her own. On the other hand, a teacher should let the student know the consequences of being caught cheating.

Quite often students only copy a number of parts of their coursework. The teacher can thus make a holistic observation of the overall quality of the coursework submitted by the students. In fact, most teachers think that they know the students well and are able to spot out any parts that are beyond the students' ability or style.

Interim assessment is another useful means to deter cheating. Milestones can be set where students are required to demonstrate the progress of the coursework and hand in draft reports for the teacher's comments. The students can also keep on developing their pieces of coursework by incorporating the teacher's advice.

The last measure, which seems to be the most effective one and is a last resort, is to hold an interview with the student if the teacher suspects cheating. The simplest form is asking questions about various parts of the coursework to test whether the student really understands what they have done. For closer examination, the teacher can pull out certain parts out of the coursework and ask the student to fill in the gaps within a reasonable time limit. Most teachers agree that if a student is able to pass this test, then it proves that the student has experienced a learning process and knows the essence of the coursework from inside out.

3.6 Evaluation

Every piece of coursework has a list of user requirements. Thus, evaluation is a stage that cannot be ignored. Depending on the nature of the coursework, a variety of evaluation processes may have to go through. Other than asking for comments from users after their hands-on trials, the teacher may allow students to gather evaluation results from peers. This can be done by arranging several teaching periods for students to present their coursework. Through questions and answers, students can then make improvements before submitting their final *reports*.

The presentation arrangement however may yield an undesirable effect as it can easily lead to plagiarism. Thus, teachers who understand coursework as a learning experience will arrange the presentation after students have submitted their *products*. Students are only allowed to include peers' comments as evaluation and further improvements in the *reports*.

3.7 Report Writing

Apart from the product, the report also forms a crucial part in the coursework. This is reflected from the assessment guideline proposed by the HKEAA.

3.7.1 Documentation

Though there are eight aspects, such as *Objective*, *Analysis*, *Design*, etc. in the proposed assessment guideline, it has been argued that they should only be used for reference. It is unwise to follow these aspects strictly in writing reports. As long as the student can express all the necessary details in an organized structure, s/he should be given the free hand to

structure her/his report. Most teachers agreed that instead of giving a zero mark, they would still give a score if a student wrote down something under the wrong category; but they would give a lower mark in the "*Documentation*" aspect. It should also be noted that in certain coursework it is not easy to divide the report into aspects as clearly as proposed. For example, to report a programming coursework, it is appropriate to merge the *Analysis* and *Design* aspects together in a closed end programming exercise, and more appropriate to merge the *Objective* and *Analysis* aspects together in an open-ended exercise.

3.7.2 Mini-projects and report writing skills

A strategy that will be employed by some teachers is to let students do several mini-projects and to train their report writing skills. These mini-projects are not necessarily related to any project or the coursework itself. In each mini-project, students are required to report on a particular aspect. Through these practices, students can gradually master the skills in writing different aspects of a report. Nevertheless, the final report written by these students for their coursework may lack variation. Another possible outcome of this strategy is that students may be reluctant to divert from the structure of aspects stated in the assessment guideline. This leads to the undesirable effect that students are hesitant to adjust/adapt the report, in terms of style, content and structure, based on their own products.

3.7.3 HKEAA's responsibility

There was an unequivocal consensus among all participants in the workshops that the HKEAA should release exemplars of *HKCEE Computer and Information Technology* reports in future, together with corresponding reports (and/or products) of different standards selected from coursework submitted in the preceding year. Teachers believed that such exemplars, with illustrations of what are expected, are important, and the discussion on these exemplars will be a good learning experience for students. Teachers also thought that every year the HKEAA should accumulate and update level descriptors of the assessment guideline used by teachers from different schools. In so doing, a pool of level descriptors can be released as reference for teachers to make, modify or adapt their own level descriptors.

Furthermore, releasing coursework exemplars from past examinations is a standard practice in many overseas examinations with elements of school-based assessment. Research findings also show that in releasing past coursework exemplars, teachers from different schools can come to a standardized judgment in a few years' time.

3.7.4 Interim report

Many teachers tend to request students to submit interim reports so that feedback can be given regularly. This prevents students from straying away from writing unstructured and

insensible reports. This also allows students to improve their reports part by part based on teachers' comments. Some teachers may even set a report submission deadline earlier than the official one set by the HKEAA so that major amendments can be made at the last minute in case students do not submit interim reports.

3.8 Marking

3.8.1 Scoring for level descriptors

There was a divided view amongst teachers on how marks should be awarded according to level descriptors in each aspect of the assessment guideline. Some teachers thought that level descriptors should be in greater detail and scores awarded accordingly so as to be fair in marking and to justify the marks given. They hold this view because they think this practice can protect them when the HKEAA or its delegates visit schools and challenge their marking.

But other teachers thought that marking according to each level descriptor would be too mechanical and flexibility should be allowed. These teachers prefer an assessment guideline similar to the one used in marking the *2002 HKCEE Information Technology* coursework, i.e. there is only a single score for each aspect. A breakdown of the score is only up to the level of major sub-items under each aspect.

Almost all teachers agree that some aspects, such as "*Creativity*", would be subjective and it is more sensible to give scores by means of a "*holistic*" view rather than on the basis of level descriptors.

3.8.2 Weighting of aspects

Many teachers thought that flexibility should be allowed in allocating weighting to different aspects due to the different nature of elective modules and the individual differences in students' work.

Take the "*Algorithm and Programming*" elective module as an example, many teachers think that the aspect "*Objective*" may not be worth 10% of the total score since the user requirements of many programming coursework, including the *Apple Chess* example cited by the HKEAA, are close-ended. They thought that the aspects "*Analysis*" and "*Design*" should weigh heavier in these kinds of programming coursework.

It is expected that either the HKEAA should set a range of weighting for each aspect or teachers can exercise their own judgment on the weighting of each aspect, provided that all aspects add up to a 100%.

3.8.3 Ways of marking

Since the HKEAA requires schools to conduct internal moderation before submitting a fair queue on students' performance, standardisation amongst teachers within the same school should be made. There are several common methods to do so.

Firstly, teachers can randomly sample several coursework from different groups of students. After marking the samples individually, teachers come together and reach a consensus on the standard of the samples. Then each teacher marks the coursework from his own group. No more moderation is done afterwards as the standardisation procedure has been done beforehand.

The second method works the other way round. Each teacher marks the coursework of his own group first. Comparison of samples of high, medium and low standards between different groups are carried out afterwards to check whether adjustment of marks should be done.

Marking all coursework by each teacher in turn is the third method. The arithmetic mean, or some other ways of calculating a mean score, of the marks scored by the teachers is then taken as the final mark.

Some schools may assign a teacher to mark all the coursework of all students from different groups. The belief in using this method is that all coursework should be judged by a single standard from one teacher only.

To this end, it should be noted that as the teacher may offer help and provide feedback to his/her students, if coursework is marked by someone else who does not know the whole process, then the mark scored may not be a true representation of the student's performance. Therefore the last two methods mentioned, in some sense, are not reasonable.

3.8.4 Maintaining a fair queue

There was an unequivocal consensus amongst teachers that it was impossible and not fair to rank coursework of different electives in a single queue.

Even if a fair queue is only meant for coursework of the same elective module, many teachers prefer to have a glimpse of all coursework first before the actual scoring procedure. This not only allows the teacher to have a general impression on the overall standard and range of quality as a whole. It also allows the teacher to adjust the level descriptors if there are

attributes missing in the assessment guideline. In doing so, the teacher has actually had a crude ranking of all coursework in the same elective module before giving marks for each coursework.

3.8.5 Product mark and Process mark

"*Implementation*" is the aspect recording how a student realizes a product of the coursework. Many teachers felt that some level descriptors listed in the "*Implementation*" aspect of the guideline provided by the HKEAA were not realistic. They expressed that it was either too difficult or too demanding to request students to report or teachers to check against the fine details of certain level descriptors. For example, the level descriptor "*use resources with some skills*" is ambiguous and it would be difficult to award a score in accordance with several such ambiguous level descriptors.

Instead of awarding scores according to so many level descriptors listed under the "*Implementation*" aspect, the majority of teachers prefer to give a single "*product mark*" for the "*Implementation*" aspect based on a "*workable*" or "*functional*" product. Moreover, teachers worry that some students may spend too much time in constructing the product and may not manage to finish the other part of the coursework, i.e. the report. So, some teachers favour the flexibility to award "*product mark*".

In some cases, students put a lot of effort in constructing a product, yet the product was either incomplete or non-functionable. Under such circumstances, whether a "*process mark*" should be awarded is even more controversial. Clear division existed amongst teachers on this issue. Some teachers thought that "*process mark*" could be given for steady progress according to schedule, positive initiation and responsible attitude towards the coursework. However, some teachers felt it unfair to grant discretionary power to teachers for awarding a "*process mark*" based on "*behaviour*" which is often quite subjective, unless the HKEAA provides clear instructions on this.

3.9 Other Issues

3.9.1 Gender issue

Observations reveal that girls usually outperform boys of the same level in writing up reports, probably due to their better language proficiency. Besides, it is a general observation that girls put a lot of effort in decorating products rather than making enhancements from technical perspectives. On the contrary, boys tend to enhance their coursework with technical features. As boys spend an abundant amount of time on technical aspects, there is a risk that they spend less time writing up a systematic report.

3.9.2 Language issue

Though the report of a coursework is supposed to be written in the same language as the written theory paper, however, students should choose a language that best fits the product. For example, a user-friendly interface is usually bi-lingual or even multi-lingual. And students should be encouraged to utilize resources (for example, information searched on the Internet, etc.) in any language that helps him/her to accomplish the coursework.

Chapter 4
Sample Coursework for Module A
Algorithm and Programming

4.1 Chapter Overview

In this chapter, six samples worked out by students as a trial run in response to the sample coursework question set by the HKEAA on "*Algorithm and Programming*" are examined. The question set by the HKEAA is as follows:

Apple Chess Game

- *Candidates should write a computer program for a single player or two players.*
- *The size of the chessboard should not be larger than 10 x 10.*
- *The game can show the results, win, lose, and draw, at the end.*

In the programming part, one of the main differences between the new *S4-5 Computer and Information Technology* curriculum and the previous *Computer Studies* curriculum is the choice of programming language. In the written examination of the "*Algorithm and Programming*" module of the new *S4-5 Computer and Information Technology* curriculum, candidates can choose either Pascal or C to answer the questions. In the coursework, a candidate can even have a free choice of a suitable programming language, other than Pascal or C, which s/he thinks appropriate to a particular question.

The six pieces of sample coursework presented here should neither be regarded as model solutions nor samples illustrating the different levels of attainment in terms of quality. In fact, the six samples have been done using a variety of programming languages in order to show what might happen when candidates are given a free choice of programming languages. There are two samples which are done in Pascal and C, the designated programming languages to be used in written examination. Visual Basic, Flash Actionscript and VBA with Excel interface are the other three programming languages/scripts used in the remaining coursework. The individuals who participated in trying out the sample question set by the HKEAA were Secondary Four, Secondary Six and post-secondary students. The framework of the assessment guideline, i.e. the main aspects, was briefed to the individuals beforehand.

The collective comments gathered from teachers who participated in the training workshop are presented in Section 4.2. The teachers discussed the eight aspects of the assessment guideline in the context of "*Algorithm and Programming*". They did so after they had read the reports and seen the demonstration of the *Apple Chess* games for 2 or 3 of the products. Different views on other generic issues such as plagiarism are also listed in 4.2.

It is advisable that teachers (or students) should go through the products and reports of the sample coursework for "*Algorithm and Programming*" on the CD-ROM first. This would help to have a better understanding of the next section.

4.2 Discussion on Coursework for Algorithm and Programming

N.B. Due to a difference in the nature of this elective module, several aspects may be grouped together for the purpose of discussion. Also, some other issues which could not be classified under the eight aspects will be highlighted in the "Other Issues" sub-section.

Objectives

1. In general, the objectives of P1 and P2 repeat what are given as requirements of the questions and mention the rules of the *Apple Chess* game. Both authors of P1 and P2 conducted an information search on the rules of the game, but they did not further elaborate on them, which would demonstrate that they have a clear understanding of the problem. It is obvious that both students thought that understanding the rules of the game was essential and knowledge of these rules was a part of the objectives to be met. Nevertheless, they failed to dig into the rules.

2. The report P3 does not follow the suggested format of report writing. Items are scattered in various parts of the report. They can in fact be better organized according to aspects. The author of P4 focused on the mode of the game – "*Single Player*" or "*Two Players*". It seems that both authors were impulsive in coding the program without a clear whole picture of what to be achieved. The author of P4 also wrongly assumed that the choice of the programming language was one of the objectives.

3. The report P5 followed P1 and P2 in a similar way of expressing objectives. However, it added the context of playing the game in a "*Family*" and thus explained the choice of the mode of the game ("*Two Players*").

4. In fact, all reports show that students interpreted the question differently. The author of P1 thought that the question was asking him to write a game for player(s) to choose from single player or two players. The authors of P2 and P3 thought that they were only required to choose one particular mode amongst the ones stated in the question. Thus, both of them simply wrote a program for two players. Perhaps it was easier for them to implement too. For P4 and P5, they were aware that they had to explain why they chose the "*Two Players*" mode and thus this became one of the objectives.

5. It is a consensus amongst teachers that there is not much room for students to elaborate on objectives since the question itself is a bit close-ended (the final product must follow the rules of the *Apple Chess* game) and the allowed chessboard is a small one. Most teachers think that 10% of the total mark is too much for the *Objectives* in this case. With questions that are open-ended or of a relatively large-scale or more complicated in nature, students would have more of their own objectives under the broad ones assumed. Teachers thus think that the weighting for *Objectives* should range from 5% to 10%, depending on the nature of the question.

Analysis

6. The analysis of P1 is simply a comparison of the choice of programming languages. The choice of a suitable tool, i.e. a programming language, was stated as part of *Implementation* in P2. The author of P3 even neglects to explain why Visual Basic is preferred. In P4, the student simply stated that she knew only Pascal and thus it became her natural choice. Only in P5 are more sound reasons given to support the choice of using Flash Actionscript, i.e. the reasons are given to explain why a particular programming language was suitable for that particular problem. P2's comparison is mostly technical in nature and looks more like a comparison of the specifications of the four languages mentioned.

7. The analysis of P2 is a detailed account of the rules of the *Apple Chess* game. He found out that the formal name of "*Apple Chess*" was the "*Othello Game*". Knowing the rules of the game helps students break the whole problem into sub-tasks. In fact, the description and the sequence of the rules given in P2 really help the student understand the design and logic (subroutines/modules, flow, etc.) of the program he eventually would code. Without knowing the rules thoroughly, some important features such as "*Pass*", "*End the Game before the Chessboard is Full*" would be missed. The report P3 shows that without understanding the problem and without advance planning, the student encountered difficulties during the coding work.

8. "*Storing the Data*", "*The Flipping*", "*User Interface & Error Handling*", "*When does the game end?*", "*The Program Flow*" (flowchart), etc. in P2's *Implementation* are better described as parts of *Analysis*. And the rules of the game should be provided as an appendix.

9. P4 recorded the parts to be tackled in the *Analysis*. However, the author put "*Check whether the move is valid*" as a sub-problem of "*To get the input by user*". In fact, "*To*

get the input by user" is more related to the design of interface. And, "*Check whether the move is valid*" can be dealt with separately. If the author of P4 thought deeper, she could have broken the problem into more details like the 9 modules (though not all correctly classified) in the *Analysis* of P5.

10. For P3, section 2 "*How does the program work?*" can be regarded as *Analysis*. In fact most teachers agree that P3 contains concrete ideas which are far better than P1. There was a view, though not of the majority, that no scores should be given to P3 for *Objectives*, *Analysis*, *Design* and *Implementation*. Teachers who held this view thought that as guidance was usually given to the students, he should conform to the "normal" report format. The view held by the majority is that the teacher who marks P3 should spend effort in finding out the bits and pieces that are relevant to *Objectives*, *Analysis*, *Design* and *Implementation* respectively, and score accordingly. But, marks should be deducted from the *Documentation* aspect.

11. The *Analysis* of P2, P5 and P4 are widely accepted by teachers as good, average and barely adequate respectively, provided that the teacher does not hold a strong view on correct items falling into the corresponding aspects. P3 is a peculiar case where teachers have mixed feelings and difficulty in judging its level attained. It is a common consensus that P1 has the weakest analysis.

12. The *Analysis* of P6 is not the analysis of how to tackle the problem. It simply repeats the rules of the game found. But the detailed account of the rules helps the student to think about how to design the algorithm. It would be more appropriate to move the rules of the game to the appendix.

Design

13. The author of P1 mistakenly thought that *Design* simply meant the design of a user interface. P2 described the use of an index system in "*The Design*" and provided a screen capture of "*Playing the game*" with captions to illustrate his design. The author of P3 adopted P2's approach with a screen capture. P5 also contained screen captures with coding displayed alongside. This reflects that students either hold a wrong concept that design is equivalent to user interface design or have difficulty in describing their design in words.

14. P4 described in fine detail how each part would be handled. For example, how to place the 4 chesses in the middle of the chessboard for both even and odd number sides (`n div 2` versus `(n div 2 + 1)`), what is going to be checked after a user inputs a pair of

coordinates, how to check whether the move is valid, etc. The *Design* part of P4 seemed to be what most teachers perceived as "design" – a more detailed description of how each module/part/subroutine is to be done in terms of coding.

15. The *Design* part of both P4 and P5, and P3 in a certain sense, recorded difficulties encountered and the author's thinking. Teachers value these efforts even though they are not sure whether these should be placed in the *Design* or *Discussion* part.

16. Though there may be a clear distinction between *Analysis* and *Design* in software engineering, many teachers believe that a S4-5 student is not supposed to follow a professional way of report writing. Many teachers agree that *Analysis* is an account of the outline (or framework) of the solution, and it probably includes an analysis of alternative ways of tackling the problem, i.e. different algorithms involved (the *Apple Chess* game is a bit close-ended and thus there are not many alternatives!). The *Design* part then further elaborates each part of the chosen solution and how to tackle them in terms of coding.

17. Some teachers even think that it is difficult for a S4-5 student to separate the *Analysis* and *Design*. In fact, sometimes it is more natural for a student to write the *Analysis* and *Design* parts as a whole. But, there exists another view that *Design* is more directly related to *Implementation* and students should bundle these two parts together in the report.

18. P6 explained why an even-numbered chessboard is needed. It also provides screen captures of how to get players' names and what the chessboard looks like at start. But there were no descriptions of design for other sub-problems, such as surrender to the opponent (*Pass*), end the game at any point (*Reset*), and etc.

Implementation

19. The author of P1 thought that *Implementation* was simply the output of the source code of the program. Even if it were the case, his source code did not contain remarks for documentation purposes. P2 put things which were *Analysis* and *Design* in Implementation. Section 3 "*The difficulties in writing the program*" of P3 seemed more like *Implementation*. The author of P4 thought that a log recording what had been done at different stages was equivalent to *Implementation*. The three screen captures in the *Implementation* of P5 were used to depict three main parts of the final product.

20. Many teachers held the view that the final product should be treated as the *Implementation*. Thus the presentation of P5 (P2 also) could partly reflect what the final product looked like and was giving an account of the *Implementation*. They also thought that evidence, probably in the form of screen captures, must be provided to prove that essential parts were functioning normally.

21. There is another view amongst teachers that *Implementation* is a compact version of a user-manual which provides the user with knowledge as to how to use the final product.

22. Despite the views stated in points 20 and 21 above held by some teachers, there is a consensus that those descriptors listed as *Implementation* in the Assessment Guideline (such as resources, program and data structure, etc) should be counted as *Design*. The majority view is that *Implementation* is something related to the final product and teachers think that they need more concrete guidelines from the HKEAA on *Implementation*. This is particularly important if the *Analysis* and *Design* are well written by students, but the final product does not work.

23. Some teachers even argue that if the question is open-ended or a large-scale one, students may spend a lot of effort in the *Analysis* and *Design* parts. There is then a great risk that the final product cannot work accordingly. So, the weighting of *Analysis*, *Design* and *Implementation* should be flexible too.

24. The discussion on choosing a programming language in P6 should be dealt with in *Analysis*.

25. Of the 6 samples presented, P6 gave a detailed account of sub-routines (`init()`, `check_line()`, `check_score()`, `check_pass()`) in *words*, not listing the pieces of program codes. These accounts are thought to show a better understanding of the program by the student.

Testing and Evaluation

26. There are not many controversial issues in *Testing* and *Evaluation*. Teachers think that they are clear about what should be included in this aspect.

27. For testing, students should be able to outline the test plan (or strategy to test his product). P1, P2, P3 and P5 are considered to be adequate or even good in terms of the test plan, while P4 is the weakest in this aspect. Most teachers considered P2 to be the best, as the screen captures were provided as evidence of certain critical functions to

be tested. P1 and P5 simply stated the strategy to test without any evidence showing that the authors had tried it out. Many teachers believe that the author of P3 is outstanding in mapping out his test plan. The author of P3 made a subroutine/module in his program through which he could set up a certain situation and check whether other subroutines/modules were functioning in the proper way.

28. P6 gave a very detailed account of testing on scenarios that were not easily checked, such as ending a game without filling the whole chessboard, and passing the right to the opponent. The author recorded the moves of the many trials he attempted and provided screen captures as evidence. It is thought to be the best testing tried out in the 6 reports.

29. However, all reports did not give a clear account of *Evaluation*. Teachers think that it is essential for other users to try the final product and collect feedback from them. The user requirements stated in the *Objectives* should be met and evaluated.

Conclusion and Discussion

30. It is agreed that most students are not clear about what to put down as *Conclusion* and *Discussion*. Very often the record of difficulties encountered, insight gained, learning experience, etc. are scattered in different parts of the report. This is the reason why we renamed this aspect as "Reflection and Discussion" in the assessment guideline proposed.

31. Most teachers think that improvements or further enhancement should form part of the discussion.

32. It is obvious that the author of P1 did not take advantage of elaborating his design of the single player mode (i.e. the AI he described in the *Conclusion*) in the *Analysis*, *Design* and *Implementation* aspects. P2's *Conclusion* and *Discussion* seems to be the best among the six reports. P5 and P3 rank middle in this aspect.

33. For P2, it is clear that the student revised his program with a user-friendly feature. However, he did not mention the improvement in his report explicitly. The screen capture shown in *Implementation* shows that it only asks for user input without giving hints of possible moves. But the user-friendly feature of hinting possible valid moves is shown in the screen capture of *Testing* and *Evaluation*. In fact, the student can state his improvement either in *Evaluation* or *Discussion*.

Other Issues

34. Unless the HKEAA issues clear instruction on whether the source code should be printed, some teachers think that students will inevitably include the print-out of source code in the report, most probably as appendix.

35. Other than reference books or other materials to be acknowledged, teachers agree that students should indicate clearly which chunk(s) of coding are "copied" from others and explain the functions of those codings.

36. Teachers agree that creativity is a subjective judgment. For example, P3 utilised the `mouseover()` function of Visual Basic to provide a user-friendly feature to determine whether a move of chess is valid. Whether a teacher gives extra marks for creativity on this user-friendly feature really depends on whether the teacher has experienced this feature before elsewhere, whether it is the only product with such feature in the whole group, and etc. A more important fact is that the feasibility of implementing this user-friendly feature depends on the choice of the programming language! For the revised text-mode application written with the C language in P2, it listed out all possible moves to the users before asking for the decision of the user. This is an outstanding way to manage a user-friendly feature. And many teachers think that P3 and P2 should both be ranked as creative in this sense.

37. Some teachers think that the author of P5 used a very suitable tool (Flash Actionscript) to implement a project on game, which is quite different from the traditional choice among Pascal, C and Visual Basic. This certainly lessens the extra effort in designing the user-interface and enhances a certain degree of interactivity. Teachers agree that it counts towards creativity (lessens the complexity of a problem). However, teachers think that the student should bear his own risk in choosing a programming language which is not taught in the S4-5 CIT curriculum. Teachers also demand clear instruction from the HKEAA as to whether students can use programming languages other than Pascal and C to accomplish a programming project. And if the teacher is not familiar with the programming language chosen by a student, many teachers think that they are not confident in assessing the students' work.

38. P6 used Excel's grid as the user interface, thus saving a lot of work in designing interface. The author of P6 demonstrated creativity in using a tool that lessened complexity and is regarded by many as creative in this sense.

Chapter 5
Sample Coursework for Module B
Organisation of Computer

5.1 Chapter Overview

The discussion in this chapter is based on the sample question set by the HKEAA in the CIT consultation document. The question is as follows:

Computer Upgrade

- *Candidates should produce a report on investigating the possibility of upgrading their personal computers.*
- *Candidates should focus on the major components of their computers.*

We shall present three sample scripts done by students in response to this question here. The students were just promoted to Secondary Six when they attempted the exercise. They were given a brief assessment guideline similar to that used in the former *S4-5 Information Technology* subject. Hence they should have had some general ideas about the need to understand and analyse the problem, consider alternatives and come up with some recommendations, and in the end have some reflection on what they have learnt in the process. However, these students were not closely supervised by their teachers, so in the end we can see some natural variation amongst the students. Each of these scripts demonstrates some merits and some weaknesses which we believe can stimulate teachers to think about what good coursework should be like. As usual, these sample scripts should NOT be seen as model answers.

The first sample C1 focuses on a specific goal, namely to improve the performance of the computer for playing games. The report reflects a good knowledge of computer hardware. However, the report needs more elaboration in many ways. The second sample C2, though quite nicely written, includes too many diverse goals, and hence cannot go very deep into comparison and elaboration as would be desirable. Sample C3 seems to be the most problematic. No specific goal is mentioned, and throughout a lot of information of doubtful relevance is given.

In Section 5.2, we present a summary of some important points raised by teachers who participated in the CIT assessment workshops. By comparing the variation amongst these three pieces of sample work, the teachers discussed the meaning of the assessment criteria. There were also discussions about teacher guidance and how teachers might interpret the general assessment guideline in relation to *Organisation of Computer*. Some suggestions

were also made about future coursework question setting. Reading the three sample reports on the CD-ROM beforehand would lead to a better understanding of Section 5.2.

We understand that it is the intention of the HKEAA to have teachers in schools developing their own assessment scheme based on the assessment guideline issued by the Authority. So in the appendix to this chapter, we present an example of such experience. Mr Leung Kin Ping, one of the pioneering teachers involved in starting the *Computer Studies* subject in Hong Kong at the HKCEE level, who has also had long and diverse experience in teaching schools at secondary and tertiary levels in both Hong Kong and Australia, has been invited to develop his own marking scheme based on the general assessment guidelines drafted by the HKEAA and the authors of this assessment package. He has also used his own assessment guideline to assess the three sample scripts. We find his sharing of experience extremely thoughtful and would be a very worthwhile reference for teachers. However, as Mr Leung says, his opinions are only for stimulating more useful and practical ideas amongst school teachers. Please note that it is not our intention nor Mr Leung's idea to mean that what he has mentioned should be taken as a model. Teachers should consider their own contexts in creating their own detailed assessment scheme.

5.2 Discussion on Coursework for Organisation of Computer

N.B. Due to a difference in the nature of this elective module, several aspects may be grouped together for the purpose of discussion. Also, some other issues which could not be classified under the eight aspects will be highlighted in the other relevant sub-sections.

Objectives

1. C1's purpose of upgrading is for playing games, but it is not expressed in a clear way. C2 expresses the objective explicitly. However, the purpose of C1 is more focused, and C2 seems to be too ambitious.

2. It is good that C2 mentions the budget at the beginning. The others have not included that. (And there are no explicit performance-cost comparisons among alternative upgrading plans in all three reports.)

3. C3 is weak in that there is in fact no specific target user(s), nor specific purpose(s) for the upgrading. This results in a lack of focus in the whole report. Even if there are some performance comparison data, there are no specific criteria for a decision.

Analysis and Design

4. What C1 says is quite sensible and to the point, but its explanation about the components is too brief. It does not help readers to understand why a certain component has such limitation while another does not. It also does not give much supporting evidence.

5. C2 is better in providing an explanation about the functions of the components in relation to the user requirements, but it still does not explain very much as to why there are certain variations in function and performance between the different options.

6. C2 has described the need for a certain performance standard of components but does not seem to have analysed the problem deep enough to point out the relationship between the required characteristics of the hardware components and the purpose, and why there is a need to use a particular choice of components to meet that requirement. In this regard C1's argument seems to be more solid. It points out options and choices in relation to the level of performance/characteristics required.

7. C3 provides some comparison of the performance of different options of components. But it is not easy to judge how much the student understands the comparison data, because little explanation is given on what the numbers stand for in the benchmarking test. Also, the other variables in some of the performance comparisons (for instance, the size of the RAM) are not controlled. Hence, the comparison is actually not fair.

8. All three reports use a lot of acronyms without explanation, like DDRRAM (double data rate RAM), SD-RAM (synchronous dynamic RAM) and so on. Students should be asked to explain what these terms mean, so as to demonstrate that they really understand the terms they use.

Evaluation, Testing and Conclusion

9. We know that the overall performance depends on how different parts of the system work together. Putting all the speedy components together does not mean that the assembled computer system must be fast, or each of them has to perform to its optimal level. Only C1 mentions this point, and this is a good point. Also the compatibility between the CPU and chip-sets on the motherboard is important. Though this is mentioned in the three reports, not much explanation has been given.

10. It is desirable that students should give a few alternatives and compare their performance and cost explicitly in relation to the need of the users before making its

recommendation about which is the best. But this is generally not done in all three reports. Teachers may need to set more explicit requirements to guide their own students.

About Teacher Guidance and Question Setting

11. C2 has too wide an objective, so it cannot go in depth into any aspects. Some teachers thought it would be better to advise students to define clearly the objectives or to narrow the scope.

12. It seems that some materials in the three reports have been adopted from various websites. It is better to indicate the source in a more specific way inside the report (e.g. where the information/materials is/are used), apart from listing them at the end of the report. This enables readers to trace how these sources have been used.

13. It is acceptable that students adopt materials from third parties, but they should relate the adopted materials to the specific context of the coursework or add explanations in terms of concepts learnt about the subject. That would show the student's own processing and understanding of information adapted beyond mere copying. The student can also relate the problem in hand to general concepts learnt in the module.

14. In order to avoid mindless cut-and-paste or plagiarism, many teachers think that it is good to ask the student to give an oral presentation of the coursework in front of the class. Although it will take up some class time, it can be seen as another learning process.

15. There were some different interpretations of the questions amongst teachers. Some teachers worried that in the end all three samples were like suggesting replacement of the system and not upgrading. But other teachers thought it was not a problem, the question only required studying the possibility of upgrading. In addition, the term "upgrading" could also be interpreted differently. Some thought upgrading meant only minor changes in the components and should not include changing the motherboard, but there were others who felt uncertain or had an opposite view.

16. There is obviously great diversity amongst students in C1, C2, and C3 as to what they understand about the expectation of the coursework. It is highly probable that C3 was misled by the statement in the HKEAA question, that focus would be put on the "components" only. There is a need for the HKEAA or teachers to give students a

clearer direction as to what is expected, and what comprises the evaluation criteria in a clear-cut way.

The Idea of "Parent-Child Question"

17. Teachers generally agreed that the idea of "Parent-Child Question" was good. The HKEAA gives a broad question and the teachers can add in a more specific context to narrow down the question to be more specific. Similarly, the teachers can allow the students to attach specific scenarios to the question, subject to the approval of the teachers.

18. If the question is more focused or contextualised, students can carry out more focused and in-depth information searches and comparisons. They can also visit some stores or consult people who are using the computer for that particular purpose, and use what they have observed to support their proposals.

19. Some teachers thought teachers' approval of the context was necessary, because if students said the original computer was 10 years old then obviously no upgrading could be done. Sometimes, students may set unrealistic goals. But teachers did not have a unanimous view on whether the teacher should have the final say, if students insisted on a scenario that appeared to be possible by the original HKEAA question.

20. Some teachers worried that an individual teacher might misunderstand the HKEAA question and would inappropriately change the nature of the question if they are allowed to attach their own meaning or scenarios or contexts to the original question. Other teachers thought this could be resolved by teachers' seminars or other means of communications after the HKEAA questions have been announced.

About the Marking Scheme

21. Some teachers thought that it would not be possible to use one universal marking scheme to assess the coursework for this module. In relation to *Implementation*, the students were not really implementing the new computer system. And as for *Testing and Evaluation*, it was very difficult for the students to do this as they had not really built that new computer.

22. Since apparently the project does not require the students to perform an actual computer upgrade, some teachers thought the *Testing and Evaluation* could be done by examining some people's computer that had a configuration similar to the one suggested.

23. However, some other teachers thought the *Testing and Evaluation* should mainly be a discussion and prediction using theoretical concepts learnt and information gathered. It would be useful even if the student made some theoretical estimation.

24. Some teachers thought that for this project of computer upgrade, the different aspects in the HKEAA assessment guideline might be interpreted in a slightly different way. For instance, *Objective* and *Analysis* may refer mainly to the understanding of the user requirements and the identification of major problems. *Design* and *Implementation* may refer to the actual working to look for and make use of information to do the upgrade, to propose options with particular attention to their different characteristics. *Testing* and *Evaluation* then refer to the evaluation of the different options according to the user requirements, costing or other factors. And *Conclusion* can be a summing up of the work to recommend the best plan(s) and reflection about what has been learnt. Actually with this kind of project, the searching and understanding of information and the subsequent use of it to make an informed decision is the major task. Information search, analysis of information and putting forth sound arguments seem important throughout all the steps.

25. Some teachers opined that in future it would be better if the HKEAA could set problems that required at least some practical hands-on work (e.g. the report should include photos about the process), so that students would not just paste information together. Also the amount of writing skill required in this project seemed very demanding.

Concluding Remarks

To conclude, even though this coursework might not include practical elements due to resource constraints, it still can be a worthwhile experience as long as students take this opportunity to search and try to understand information on their own, and get teachers' feedback or have class discussion to improve their understanding. It is desirable that teachers can adapt the question set by the HKEAA with consideration of the ability of their students, and to try to contextualize the question, or to provide a certain focus for their students to work on. In this regard, communication amongst teachers from different schools should be encouraged, and professional teachers' associations should have an active role to play. Teachers think that the problem statement given by HKEAA should be clear, carry enough details to indicate its purpose and emphasis, and at the same time should leave room for school-based adaptation. Teachers also proposed some modification of the general assessment guideline to suit the nature of coursework related to computer organization.

As mentioned previously, this chapter ends with an appendix for teachers' reference by Mr K.P. Leung. This appendix is meant to be one for simulating thoughts, and should NOT be treated as a model for assessing similar questions set by the HKEAA.

Appendix 1

My experience in Assessing the Sample Coursework of Elective Module (B): Organisation of Computers in the Computer and Information Technology Subject

By
Leung Kin Ping
May 2003

Preamble

I am glad to see the change in the formal assessments of students in Hong Kong, after many educational reforms, from using only multiple-choice and question-and-answer types of assessments, to the inclusion of assessment of project coursework. It is a positive step for a subject like *Computer and Information Technology*, which is practical oriented.

I am glad to be invited to share as I can contribute to educating the upcoming generations by offering my opinions on the method of assessing project coursework related to *Organisation of Computers*. I hope my opinions can be useful and worthwhile to stimulate more useful and practical ideas amongst school teachers.

General Comments on the Marking Schemes

Several versions of the assessment guidelines have been given to me for reference. They include the IT subject course work assessment guideline, the draft assessment guideline produced by the HKEAA for consultation, and the assessment guideline suggestions made by Mr Chan, Mr Ki and their PC Ed students at the University of Hong Kong. They are all well prepared. From my experience as a teacher myself who has been teaching computing and IT at secondary and tertiary levels and designing marking schemes for the subjects and modules that I taught, I think the marking scheme for the four different kinds of projects should not be exactly the same, although they should share some common characteristics inherent from the nature of project work. There can be similarity in the general structure in the allocation of marks, but the exact headings and sub-headings of scoring should vary. Also we can see the sample project questions for Elective Modules A and D (creating *Apple Chess* game and a children's library multimedia catalogue system) are more similar in nature, and quite different from those for Module B and C (proposing computer upgrade and network plans). The marking schemes should reflect this difference in the nature of the task. Furthermore, as project tasks might vary from year to year, the marking schemes should allow room for modification from task to task.

Comments on the Sample Scripts on Computer Upgrade

I have been given the sample scripts C1, C2, and C3 for trial marking and comments. I can see that the question given is not very specific. "*Computer upgrade*" as the title can be a bit too broad. Narrowing the scope to some specific situations would help to focus students' discussions, and allow able students to concentrate on important areas instead of shooting all the stars. Narrowing the question can be done by the HKEAA or by individual teachers of the schools, or even by students under the approval of the supervising teacher, depending on flexibility the authority is going to allow.

The specific situation identified should include a description of the initial/original system. There should also be a description of the target users or purposes. To provide more variety and be more practical oriented, the questions for different groups or students could be on different target users or purposes, for example, to upgrade for playing Internet games, computer games, audio/video capturing, AV editing, graphic development, multimedia programming development, and etc.

There is also an issue about the possible different interpretations on a clause like "*deciding whether it is possible to upgrade the computer to meet a certain user requirement.*" To some people, upgrading of the computer means only the changing of certain components of the computer, but to others, it may include the purchase of a new computer. (For example, when many companies upgrade their computer systems, they actually replace their existing computers with new ones.) So either the HKEAA, or the students will have to clarify what they mean in the early stages of the work.

I think it is also desirable to set a word limit for the report. Limiting the number of words may limit the depth of the descriptions and discussions of the components, systems, reflections, etc., but it also encourages students to use their words more concisely which is a good practice.

Developing my Own Assessment Guideline

I know that it is the intention of the HKEAA to give teachers some degree of freedom in determining their exact marking schemes. I think this process of creating my own marking scheme is useful. It helps me to have a clear picture of what I expect from the students in accordance with the aims of the subject and the elective module, and enables me to mark the scripts fairly, conscientiously and reasonably.

From the syllabus of the subject, the aims of the subject are

(i) to develop an understanding of the computer system;

(ii) to apply the concepts and skills to solve real life problems;

(iii) to nurture problem solving, critical thinking and communication skills;

(iv) to appraise the impact of computer & IT; and

(v) to develop their own values and attitudes.

I find that the question on computer upgrade is a perfect exercise that fulfils all the aims. Along with the broad structure as an outline in the versions of assessment guidelines I received, I devised the following more detailed guideline for my own marking:

I) Objectives of the Upgrade

a) Technological Background Context and Needs
(What's new out there which tempts us to upgrade our system?)
[This section asks students to appraise the impact of computer & IT on our everyday life (item (iv) above).]

b) Target User, Situation or Purposes
(Why should we upgrade?)
[This section develops students' values and attitudes relating to the proper use of computer and IT (item (v) above).]

c) User Requirements and Scopes
(What should be considered as important?)
[This section develops students' critical thinking and communication skills (item (iii) above).]

II) Investigation and Analysis of the Problem

Identify areas that cause problems in the existing system where something has to be done.
[This section develops students' problem solving skills to apply concepts and skills to solve real life problems (items (i) and (ii) above).]

III) Study of the Components involved in the Upgrade and Drawing up Alternative Plans

a) Discuss the functionality of important components in the system, and characteristics of each component
[This is the most important part of the whole assignment which aims at developing a genuine understanding of the computer system (item (i) above). Students have to apply

the knowledge, concepts, theories, etc., learnt in the subject and to present a persuasive recommendation of the chosen upgrade plan (item (ii) above).]

b) *Suggest Alternative Upgrade Plans with justifications*

[This section develops students' critical and diverse thinking and creativity (item (iii) above).]

IV) Analysis and Evaluation of the Upgrade Plans

a) *Compare the performance of different components in different configurations*

[This section enables students to apply what they have learnt to solve practical, real life problems (item (ii) above).]

b) *Describe the guidelines used to evaluate the upgraded system*

[This section develops students' critical thinking, communication and writing skills (item (iii) above).]

c) *Using the guidelines and the results of comparisons, comment and justify the merits and weakness in each upgrade plan.*

(Informed by the requirements and facts, how should the choice be made?)

[This section develops students' ability to apply their knowledge (item (ii) above).]

V) Conclusion and Discussion

a) *Draw conclusions for the most appropriate upgrade plan(s)*

[This section develops students' reasoning, critical thinking and writing skills to provide a persuasive recommendation (item (iii) above).]

b) *Mention knowledge or insights gained in the coursework*

[This section gives students an opportunity to reflect on the whole exercise, which is important in the learning process.]

c) *Suggest improvements for further development*

[This is an important section which nurtures students' forward-looking attitudes, creativity and life-long learning (item (v) above).]

VI) Quality of the Report (Document and Presentation)

a) *Writing style and terminology*

b) *Effective writing skills: use of words, spelling, grammar, punctuation*

c) *Effective use of text and illustrations*

d) *Use plain language, avoid jargon, explain when jargon is necessary or used*

[These scores are about students' writing skills (item iii above).]

e) *Acknowledgment of all sources of assistance and information*

[This score is about developing students' proper attitudes in writing. Their arguments should be supported by reference and the assistance and reference should be acknowledged (item v above).]

VII) Creativity

a) Unique perspectives in the philosophy and/or method of upgrading computers
[This score encourages students' creative and diversified thinking.]

b) Description of special features relevant to the upgrade
[This score encourages students' self-initiative in in-depth study on certain properties or features of the hardware or software which are relevant to the exercise but not normally mentioned in classes or by ordinary people. It may include technical, philosophical, practical, aesthetic, economical or social concerns and deeper understanding of certain aspects involved in the project assignment.]

My Marking Scheme

Based on the discussion above, I developed my own model answer in mind and used it to set up a marking scheme, which will be described below. However, I anticipate that the line of thinking of students might be different. To cope with different students focusing on different perspectives, it would be very difficult and often not appropriate to give marks based on a rigid marking scheme. So the marking scheme below only serves as a general reference.

I) Objectives of the Upgrade (10)

a) Technological Background Context and Needs
It includes recent developments in computer and other technologies in games, graphic design, communications, leisure applications, etc., which arouses people's intention to upgrade their computers

b) Target User, Situation or Purposes
It includes the background of the target users, what and why they want to upgrade their computers

c) User Requirements and Scopes
To meet the demand and expectations of these users, what are the requirements in their monetary considerations in relation to hardware and software?
There are three general levels of standard:
1= Can state the points
2= Can produce reasonable descriptions and explanations of the points
3= Clear descriptions and explanations with supporting evidence or reference

II) Investigation and Analysis of the Problem (10)

Identify areas which cause problems in the existing system where something has to be done, such as some of the following:

(i) Hardware Specifications of:

- Speed of CPU
- Speed of Display Card
- Type, Speed and Size of RAM
- Limitations of the motherboard
- Secondary Memory Sub-system
- Peripherals

(ii) Software Performance

(iii) Speed, Compatibility, and Capacity of Operating System

(iv) Requirements for Programs and Utilities

(v) Compatibility of Software and Hardware

(vi) Matching Hardware and Software Specifications

Or other things in order to meet the requirements of the users.

III) Study of the Components involved in the Upgrade and Drawing up of Alternative Plans (35)

Remark: This is the most important part of the whole assignment. Students have to use the knowledge, concepts, theories, etc., learnt in the subject, with research information, and apply them to present reasonable recommendations for upgrading the computer system.

a) Discuss the functionality, importance in the system, and characteristics of each component relevant to the upgrade. For the sake of brainstorming, I listed the many possible characteristics of components which might be considered. (Please note that some may NOT be relevant for a particular purpose of upgrade, but on the other hand some unexpected items may come up in the students' work.)

(i) CPU:

- Intel/AMD
- Socket
- Bus System, Word Size, Address Size
- Clock Rate, FSB
- Cache, Pipelining, Hyper Threading
- Heat and Fan, etc.

(ii) RAM:

- Types: SD, DDR, RD
- Size: 64/128/256/512 MB/1 GB

(iii) Hard disk:

- Size: 20/40/60/80/120 GB
- Speed: 5400/7200
- Buffer Size: 2/8 MB

- Noise Level
- IDE/SCSI

(iv) Motherboard:

- Chipset
- CPU: Single/Dual Processor, Max Speed of CPU Supported, P4 and HT Compatibility
- RAM: Max RAM, Number of RAM Slot, Dual Channel, Max Speed of RAM Supported
- Number of PCI Slots
- AGP 2X/4X/8X
- Number of IDE Slots and Devices, SATA and RAID Support
- USB 1.1/2 ports 2/4/6/8
- IEEE 1394 Firewire ports 1/2
- Onboard LAN and speed
- Onboard Sound and Quality: Stereo/5.1/6.1/7.1, S/PDIF digital I/O
- SCSI Support
- Other Peripheral Support: Infrared Port, etc.

(v) Display Card:

- GPU, Speed, Instruction Set
- RAM: Type, Size, Bit Width, Speed
- Support DX7/8/9
- I/O: DVI/D-Sub, VIVO, S-Video, Tuner: Analogue/Digital, Remote Controller

(vi) Monitor:

- CRT/LCD
- 15/17/19 inch
- Resolution: 1024X768/1280X1024/1600X1200
- Visual Angles: 140/160 degree
- Pixel size: 0.248/.264/0.279/0.28/0.297 mm
- Contrast: 200:1/250:1/300:1/…/700:1
- Brightness: 250/300/350 cd/m^2
- Response time: 12/15/25 ms

(vii) Sound Card:

- Playback Quality: 24 bit/192 KHz
- Recoding Quality: 24 bit/96 KHz
- Signal to Noise Ratio: 106 db
- Surround Sound, Dolby System, dts, MP3
- S/PDIF digital I/O

(viii) CD-RW:

- External/Internal

- R/W/RW Speeds
- Buffer
- Burn-Proof Technology
- Compatibility with writable and rewritable CD-ROM available on the market.

(ix) DVD Player: Essentially the same as (v) CD-RW and CD-ROM

- Speed: 4/8/16/32X

(x) DVD Writer: Essentially the same as (v) CD-RW

- DVD+ +RW, DVD-RW or DVD±RW
- 2/2.4X
- Buffer
- Burn-Proof Technology

(xi) Power Supply:

- 250/300/350 W
- P4 Compatible

(xii) Operating System:

- Functionality
- Compatibility
- Stability

If the student discusses a feature relevant to the purpose of the upgrade, I think there can still be three general levels of depth:

1= Mention the feature

2= Can provide information/evidence about the variation/options of the feature

3= Can apply concepts/theories learnt in the subject to explain the variation/options and the implications.

I think with this brainstorming list I should be in a better position to judge both the breadth and depth of students' thoughts.

b) Based on the discussion in (a) the student should come up with a few alternative upgrade plans/configurations. I also did a brainstorming. I thought one might think about different plans from the easiest and cheapest approach, like adding RAM, to upgrading CPU and RAM, or to changing the motherboard, CPU, RAM, Display, etc, or even to moving onto a totally new system: MB, CPU, RAM, Display, HD, CD-RW, DVD, Combo-Drive, Peripheral Cards…

IV) Analysis and Evaluation of Upgrade Plans (10)

a) Compare the performance of the different configurations (based on performance of components, compatibility of speeds, maximum attainable performance, stability, etc.)

b) Describe the guidelines used to evaluate the upgraded system (such as its performance, technological, economical, psychological, or social considerations)

c) Using the guidelines and the results of comparisons, comment and justify the merits and weakness in each upgrade plan

V) Conclusion and Discussion (10)

a) Draw conclusions for the most appropriate upgrade plan in terms of
   (i) User Requirements
   (ii) Technological Features
   (iii) Performance
   (iv) Cost-effectiveness,
   and make recommendations for the upgrade plan
b) Mention knowledge or insights gained in the coursework
c) Suggest improvements for further development

VI) Quality of the Report (Document and presentation) (10)

a) Writing style and terminology
b) Effective writing skills: use of words, spelling, grammar, punctuation
c) Effective use of text and illustrations
d) Use plain English, avoid jargon, explain when jargon is necessary or used
e) Acknowledgment of all sources of assistance and information

VII) Creativity (15)

a) Unique perspectives in the philosophy of upgrading computers
   (only as examples)
   (i) Performance considerations or financial compromise
   (ii) Advantages of selecting best components according to specifications
   (iii) Simplest upgrade that can meet the requirements
b) Description of special features of components relevant to the upgrade illustrating in-depth information research and understanding as well as the demonstration of a strong initiative in self-directed learning of relevant technology.

My Comments of the Sample Scripts

The following are my comments after marking the scripts, which I would like to share with teachers.

I) Sample Script C1

This student did not make explicit the target user. It gave an impression that he or she (for simplicity, I use he from hereon, not gender bias) was driven by the technological advancement rather than the need. But he mentioned playing the latest game software, so

we could assume that the target users were computer game players. The requirements were therefore geared towards the satisfaction of these players.

He mentioned and discussed the features of the components in the existing and upgrade systems, but the descriptions were too brief. Given time to search for information, I think we could ask for more than just a brief description such as more understanding of the features of each component technically. Through this assignment, we could expect students' understanding about these components to be greatly enhanced.

The student mentioned explicitly alternatives for the upgrade, but a systematic list of alternative configurations should be encouraged.

The student compared the performance of the components of computer systems. If he could give some theoretical explanation or supporting evidence, beyond a subjective statement of judgement, he could have received more marks in this part. By the way, I think his choice of GeForce 4-MX440 64MB is a bit too low in graphical power to handle all 3D games. According to some reports (refer to p. 32 & 33, GigaMag, Vol. 153; p. 32 & 33, GigaMag, Vol. 154) display cards that can play most recent 3D computer games need to have at least 128 MB of GeForce Ti 4200 or Radeon 9500. But when cost is considered, different brands of motherboards, RAM, CD-RW, and display cards may end up with great differences. The student could consider reporting the performance difference and the price difference at the same time before he recommended the decision.

The student mentioned that not all hardware components could be upgraded as one likes (like the compatibility problem between the CPU and the motherboard.). That is a very good point. The student provided a front page and a table of contents, which is important in a good writing style. However, there was no reflection, nor recommendation for further development in the end.

The good point in this assignment is the student's comparison of the components and pointing out of the alternatives. However, more in depth discussion, explanation and applications of the concepts and theories in the comparison are desirable.

II) Sample Script C2

This student did not mention anything explicitly about the new development in computer technology. He mentioned all target users, though a few too many to be satisfied at one time, but this is often the case in real life. He also mentioned the requirements, though not listed out explicitly. For a good writing style, the requirements could be listed in point form as a summary. There should also be a front page and a table of contents.

He had some brief discussion on the components in the first section. This discussion did not make much use of the knowledge learnt from the subject and the description was a bit too superficial. He should at least define what was meant by the jargon M Hz and G Hz, MB and GB, SD, DDR and RD. Fortunately, he did a much better discussion on the components when he discussed the features of the system he recommended. He mentioned more technical features with explanations. However, the weak point in this part is that he did not provide alternatives for people to choose from. He only said that the proposed new system should meet most of the user requirements but did not elaborate nor mention alternatives. It is only in the end that he pointed out the possibility of future upgrades. That is very good for his critical and diverse thinking. However, some of these alternatives which he had in mind, but did not take, should be mentioned earlier for comparison.

He listed the websites as reference. It is expected he should also list books and web pages with specific reference to the knowledge and concepts used in the report.

I believe the student has learnt a lot by doing this assignment. He has gained a deeper understanding of the concepts and theories. It would even be better if the project could be more focused on one or two areas so that he could discuss in more depth the features of the components in generic and technical terms, and then apply them in his discussions on the old and the upgraded systems.

III) Sample Script C3

Probably limited by his ability in expressing himself, the student could not argue why there was a need for upgrading the computer except for very superficial statements. There was no clear target user or requirements, except a general wish to raise the performance of the computers. The student did a lot of writing that was not directly relevant to the upgrade (such as the previous history of computers, and the detailed description of the CPU and Dynamic RAM.)

When it came to the descriptions of the CPU, RAM and motherboard, as well as the information on system resources and the interrupt assignment, no specific relation was drawn between what was said and what was intended, thus the things written did not look very different from a simple copy-and-paste from websites or books.

The student should be made aware of the fact that while in the practice of marking public examinations, a candidate can often get marks for putting in terms without much elaboration and explanation, and markers of project work would look for relational understanding more than just the stating of information and view points. Further, the candidate might actually be

penalising himself by spending too much time and effort on writing things that might appear to be unrelated.

Epilogue

If I were to rank the three sample scripts, the order will be C2, C1 and C3. However, I think teachers should note that there are merits in each of the sample scripts which if put together would make the work quite excellent: C1 is very well focused, C2 gives better explanations on components in relation to the user requirements, and C3 explicitly tries to compare options based on supporting evidence.

Due to time constraints and not familiar to the syllabus, and my own background, I may be biased to the perceptions and perspectives that I have, therefore, my thinking will be different from many of the teachers who are experts in the area. I hope my views can be seen as stimulation for further thinking about the "*Organisation of Computer*" project work assessment. If there is any help that I can offer, I would be more than happy to do so.

Chapter 6
Sample Coursework for Module C
Data Communications and Networking

6.1 Chapter Overview

We shall review three samples of students' work on the sample question for *Data Communications and Networking* set by the HKEAA in the consultation document. The question is shown as follows:

Local Area Networking System

- *Candidates should produce a report on setting up a local area networking system in a medium-sized trading company.*
- *The report should describe in detail the information technology employed in running the business.*

The purpose of reviewing these students' work is to stimulate the discussion among teachers on how coursework related to networking can be facilitated and assessed. These samples are not intended to be models. On the contrary, only a brief introduction to the assessment guideline (the one used originally for the *S4-5 Information Technology* subject) was given to a group of students who had just been promoted to Secondary Six. The intention was to let their work show some natural variation, so that we could be more aware of problems that may occur in our future setting of coursework questions, as well as the supervision and assessment of the coursework.

Because of the limited resources, it is quite unlikely students can have access to a medium-sized trading company and can really set up a network in a real practical sense. So the question is interpreted mainly as "*to produce a report that proposes*" how such a network can be set up.

Furthermore, as can be seen, the word "setting up" has led to confusion among the students. Some may emphasize more the decisions concerning the network configuration, and some may emphasize more the actual practical process of laying the network and making cable connections among devices, and some may try to include both. So the review of these samples also indicates some useful ideas about question setting in the future.

The first sample is quite all rounded and of reasonable quality. The second sample, however, has a rather vague concept of the company, and the network diagrams provided are about different general concepts. So there is difficulty in seeing what exactly the proposed solution

is like. The third report shows that the student knows the matter quite well, yet the organisation of report needs to be improved. Furthermore, the offsetting for the company assumed is quite rare in reality.

Reading the sample reports on the CD-ROM first shapes a better understanding of Section 6.2, where we shall present some overall comments on the three samples generated from the teacher workshops. At the end of the chapter, a practitioner in the area has also been invited to give a skeletal illustration of what he would actually do when he provide companies with networking solutions for teachers' reference.

6.2 Discussion on Coursework for Data communications and Networking

N.B. Due to a difference in the nature of this elective module, several aspects may be grouped together for the purpose of discussion. Also, some other issues which could not be classified under the eight aspects will be highlighted in the other relevant sub-sections.

Objectives and Analysis

1. All three samples provide a good illustration of what should be done in this part. The samples show that the problem should be contextualised. A particular situation should be described, with specific information about the company trade, department structure, physical locations, equipment types and number, objectives in setting up the network, budget and management concerns and so on. Without such information, no planning can be done.

2. The analysis part should identify major questions to be addressed or what major technology options are available and so on.

Design, Implementation, and Testing

3. In developing the design of the network, it is expected that the student should look up more information in order to answer the questions raised in the *Analysis* part. Students should demonstrate their understanding about major concepts learnt in the module through clear presentation of arguments in making comparisons. They should also quote the information used to support/justify their comments, choice, arguments or conclusions.

4. The students should include an overall network diagram that shows clearly the major devices and their connections, followed by a systematic step-by-step description of the

network (see comments on N1). The diagram and description should be a specific networking proposal, not just an illustration of general concepts (see comments on N2).

5. Since it is envisaged that the students will unlikely have the opportunity of really doing the whole implementation, they can give some guidelines/explanation about important points in the implementation, as well as the testing of the network, so as to demonstrate their understanding about these areas.

6. If possible it is also desirable to include some practical experience in the learning process, such as a visit to relevant sites, or a hands-on experiment on a part of a network. Such experience can also be included in the report.

Discussion and Conclusion

7. In this part, students can recap a discussion of the strengths and limitations of their design, and highlight important things that they see as relevant or significant for solving other problems of a similar nature.

About Question Setting and Coursework Supervision

8. Teachers in general agree that it is necessary to contextualise the question set by the HKEAA to a particular situation for design questions of this type, and it would be desirable for teachers to exchange ideas in how the question can be adapted.

9. On the other hand, teachers thought the question set by the HKEAA should try to minimize certain ambiguities. The given sample question for instance can be read in a few different ways. One can read "*a report of setting up a local area networking system in a trading company*" as one emphasising on the choice of a certain set-up (versus the other possible set-ups) or as one emphasising on the detailed setting up processes. The clause "*should describe in detail the information technology employed in running the business*" can also be interpreted in many different ways. The technology may mean the communication or network services (more related to data communications and networking) or database/multimedia technologies (which is more related to the other modules in the curriculum).

10. Teachers in general thought it desirable to include some practical elements in the coursework, so that it was not just a "paper work" or information collection exercise. Other ideas related to this point include:

- Teachers did not deny the educational value of asking students to look for information, but it would also be necessary to relate what they had read to what they could experience directly.
- Some teachers suggested that the HKEAA to consider adding some practical work elements (like what was being done in TAS) to the coursework requirement.
- Some teachers suggested that even if the coursework question did not require practical skills (i.e. cannot be examined as part of the coursework), practical skills should still be done/taught in the networking module. Simple practical activities like making UTP cables, connecting several computers to a hub, and so on should be carried out. This would help students develop a more solid understanding of networking.
- Some suggested to base the project on site visits to real network examples. For example, a visit can be arranged to a company to learn about its existing network. Students could learn how to draw network diagrams to represent such systems. They could see the devices and their connections. Based on such example, teachers could ask students to focus on particular aspects, and to analyse/compare possible options. For example, some could study about whether part of the existing network should be changed to wireless. Others could work on changes such as what should be done when the company was going to have a new branch office. Students could look for information in a more concrete way. They could compare different options available in the market and try to understand the difference between technologies, as well as the pros and cons in terms of the concepts learnt in the module.

11. Teachers also discussed their expectation of students. In considering the network connectivity of a company, in the case of a real business, the specification usually would require a certain level of reliability (e.g. 9 to 5 or 24 hrs, maximum down-time allowed, budget, security control, and who has the full control). Yet, it may not be appropriate to require students at the HKCEE level to look at such details as to what the professionals would do. If the student can perceive things in terms of what they have learnt in the networking module, and apply them with analytical minds, it is already a very good learning experience.

12. It is reasonable to expect some confusion in concept to arise in the coursework when students try to relate theory to practice, and this should be taken as good opportunities for learning. So it may be particularly worthwhile for the network project to require students to hand in their first report in the interim, so that teachers can highlight areas or concepts that deserve more discussion with the students. In N2, under the subtitle "*Possible Solution For This Project*", it says, "*Nowadays, the most common topology*

for LAN is STAR topology, using Fast Ethernet technology as well. With its advantages of cheap, easy, and fast (because collision)". Yet, what is the meaning of "*its*"? Is it talking about star or Ethernet? Also, collision is a property of shared media of Ethernet CSMA/CD. Why did the student say there is "*less collision*"? Under the section "*Design of the LAN*", N2 also says, "*For security reasons, router integrated with firewall is essential*". What are the functions of the two? Why must they be integrated? N2 also says, "*Because the sharing of Internet connection, a router which supports several common Internet connection technologies (i.e. PPPoE) is needed*". Here, why did the student use "*i.e.*"? Must it be PPPoE? Students would sometimes take it for granted for what is existing without really thinking about why and whether there are other alternatives. Teachers play an important role in these cases. The student of N2 is not saying things that are totally wrong, but the concepts and logical relationship just need more clarification. Thus, teacher's feedback and class discussion about the first draft of the report can be a valuable step in the learning.

13. In this iterative process, the students can learn to appreciate the importance of writing concisely and precisely. They also learn to balance between pros and cons of each plan, weigh alternatives, justify their proposals, put forward logical reasoning and use accurate terminology as well as text and diagrams appropriately.

Concluding Remarks

14. To conclude, teachers hope there can be more practical experience involved in the coursework. They realise that because of resource constraints, this can only be done in a limited way. However, they consider that the coursework can still be a worthwhile experience, if the students can take this opportunity to search and understand information on their own, and to get teachers' feedback or have class discussion to improve their understanding. Students can also try to relate theories and practice in reasonable and logical ways. In the end, the students may still not be able to produce proposals at professional level, but some applications of the ideas taught in the networking module should be expected. As mentioned in the previous chapters, it is desirable that teachers can adapt the question set by the HKEAA with consideration on the ability of their students, and try to contextualize the question, or to provide certain major focuses for their students to work on. In this regard, communication amongst teachers or even with network engineering professionals should be encouraged, and professional teachers' associations should have an active role to play. Teachers thought that the problem statement given by the HKEAA should leave room for school-based adaptation, but at the same time should carry enough details to indicate its purpose and emphasis.

The appendix to this chapter is a skeleton of what an engineer might do in preparing a real network proposal. It is meant to be information for reference and NOT as a model of what students should do.

Appendix 2

This is an appendix for teachers' reference. It is a framework of what an engineer might do in preparing a network proposal. The information is meant for interest, and NOT as a model of what students should do. We wish to acknowledge our gratitude to Mr Raymond Key, a professional engineer in networking for providing us with this information.

(A) REQUIREMENTS

Facts about the company

- Business: Trading.
- Staff Size: 40-50.
- Organization: General Manager, Assistant General Manager, Personnel Division, Finance Division, Administration Division and four Business Divisions.
- (Organization chart)
- Office: 22/F and 23/F in the same building; each floor 40m by 30m; internal staircase connecting the two floors.
- General Manager, Assistant General Manager, Personnel Division, Conference Rooms and Show Rooms on the 23/F; Finance Division, Administration Division and all four Business Divisions on the 22/F.
- A system/network equipment room has been reserved on 22/F. It is right next to the internal staircase. No space has been reserved on 23/F for a wiring closet, but it can be allocated if so required.
- (Office layout)
- Business Hours: 9am-5pm, Mon-Fri
- Expected to be the same size and in the same office for the next 5 years.

Who is responsible for IT functions?

- An IT administrator has recently been appointed to take responsibility for the entire system and network administration. He reports to the Assistant General Manager.

What systems/networks does the company have now?

- Finance Division: a network of 4x MS-Windows PCs, 1x MS-Windows2000 server and 3x laser printers connected via loose cables to an 8-port ethernet (10M shared) hub; supports the Accounting System; network protocol is TCP/IP.

- Administration Division: a network of 5x MS-Windows PCs, 1x MS-Windows2000 server and 2x laser printers connected via loose cables to an 8-port ethernet (10M shared) hub; supports the Order Processing System and Product Database System; network protocol is TCP/IP.
- Personnel Division: Personnel System is on a stand-alone MS-Window PC.
- 20x standalone MS-Windows PCs.
- All PCs, networked or stand-alone, run MS-Office.
- For each division, one PC has a modem dialup connection to the Internet.
- The company has a domain name registered.
- Public web page hosted by the ISP.
- Each division has one Internet email account hosted by the ISP.
- No internal email.
- No internal web page.

What does the company want to achieve?

Objective

- To improve company-wide information flow and resource sharing.

Build a local area network

- To build a data communication infrastructure which enables all PCs and servers in the office to exchange data with each other.
- To replace the existing multiple division level networks with a company wide network.

Improve the operation of existing information systems

- To support current systems. Enable more users to use the systems from their desk. Business Division users can access Order Processing System, Product Database System and Accounting System from their PCs, with proper authentication and authorization control.
- To improve order processing workflow. Current workflow: Business Divisions fill in forms, submit them to the Administration Division, then input them to the Order Processing System; the Administration Division controls the order processing and provides a statistics report to the Business Divisions; when the Business Divisions need an up-to-date status of an order, they can call the Administration Division to check or go there physically to check on their PCs. New workflow: Business Divisions input orders on their PCs (connected to the Order Processing System via the company-wide network); the Administration Division controls the order processing; the Business Divisions can inquire about the status of an order from their PCs and print statistics reports on their printers. The same for the Accounting System and Product Database System.
- Management can access information on any system from their PCs, with proper authentication and authorization control.

Internet connection

- To upgrade dialup Internet connections to one higher speed permanent connection.
- All users can share the connection to the Internet.
- As a minimal security measure, a firewall is required to stop any inbound connections from the Internet except those explicitly authorised.
- The public web page will stay with no change and be hosted by the ISP.

Remote access virtual private network

- Managers, the IT administrator, staff on business trip and some authorised users can remotely connect to the office network via the Internet with encryption and authentication.
- Up to 20 concurrent remote connections should be supported.

New systems

- Email system for internal and external communication. Each staff member has one Internet email account.
- Internal web page for more efficient internal information sharing.

Resource Sharing

- File storage sharing.
- Printer sharing.

Performance

- 100Mbps for PCs.
- 10M/100Mbps for printers.
- 100Mbps for the two existing servers (Finance Division server and Administration Division server).
- 100Mbps for a new file server. This may need 1Gbps in the future.
- 100Mbps for a new server supporting email.
- 100Mbps for a new internal web server. This may need 1Gbps in the future.
- 10Mbps for Internet firewall.

Downtime

- During business hours, any network equipment failure should be recovered within 6 hours.
- Outside of business hours, any network equipment failure should be recovered within the first 6 business hours in the following business day.

Lifetime

- To support the company for 5 years with no major upgrade.

Central management of IT resources

- To relocate all servers and network equipment to the equipment room on the 22/F.
- All IT resources centrally controlled by the IT administrator.

Management Preference

- To avoid technology risk. Use mature, proven, widely implemented technologies and products.
- Simple design, easy to understand and manage.
- Require minimal in-house technical expertise to operate.
- Consider only well known vendors with excellent support services. Cisco is the preferred network equipment vendor.
- All existing PCs run Microsoft software and are working fine. Users and system administrators have acquired skills on Microsoft software. Prefer Microsoft to other software vendor.
- Cost Effective.

Site Inspection

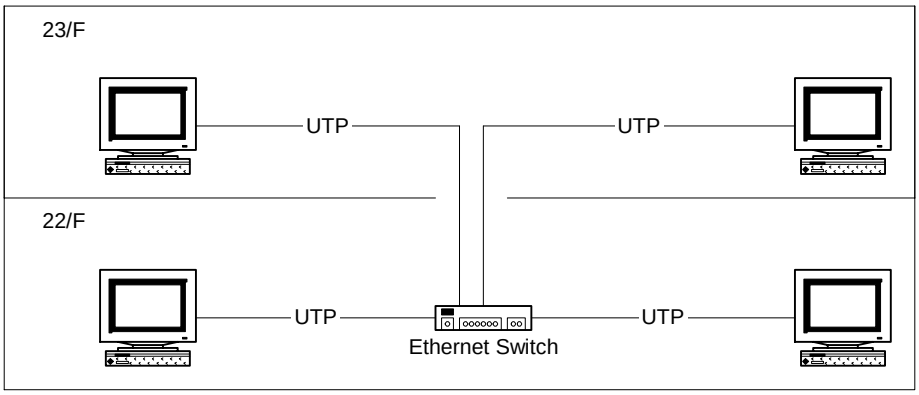
- Number of network connections required inside the equipment room: 6, including firewall for Internet connection
- Number of network outlets required on the 22/F: 45
- Number of network outlets required on the 23/F: 13
- The internal staircase is in the centre location of the floor layout.
- The equipment room is on the 22/F and is next to the internal staircase. There is no problem in installing a cable trunk and running the cable from the equipment room to the 23/F via the staircase opening.
- The estimated cable length from the equipment room to any network outlets on the 22/F: 10m-50m.
- The estimated cable length from the 22/F equipment room to any network outlets on the 23/F via the internal staircase: 20m-60m.
- If a wiring closet is a must on 23/F, limited cabinet space in the Personnel Division can be allocated. The Personnel Division is at one corner of the 23/F. The estimated cable length from the Personnel Division to any network outlets on 23/F: 5m-80m. The estimated cable length from the 22/F equipment room to the 23/F Personnel Division: 60m.
- (Office layout with required network outlets marked)

(B) DESIGN

Protocol Standard

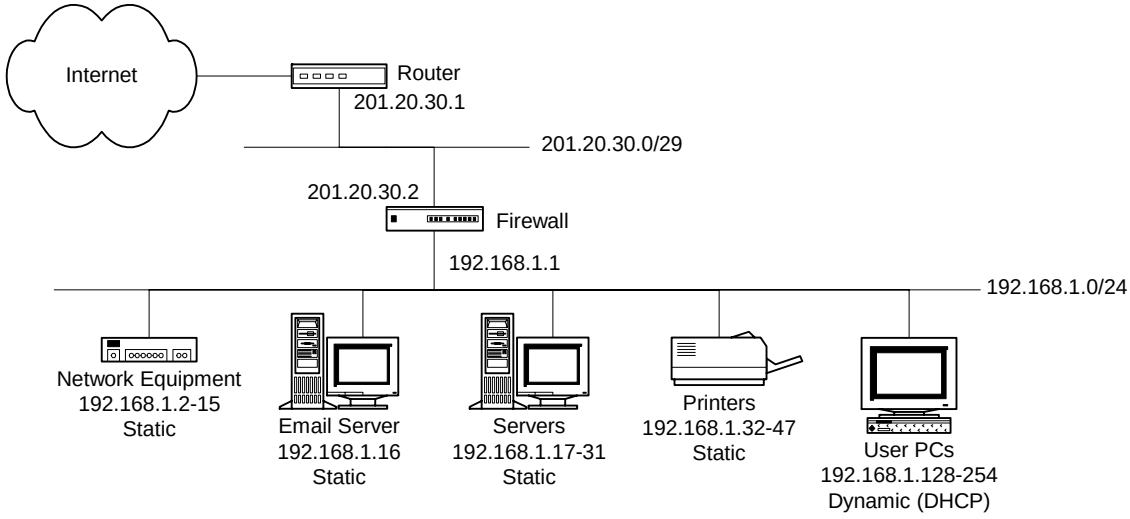
- IP and Ethernet

Ethernet LAN



- Star topology. The 22/F equipment room as the centre, connecting all network outlets on both the 22/F and the 23/F. Cables can be run across floors via the internal staircase opening.
- Cat5e UTP 4-pair cable to every network outlet.
- All connections use 100Mbps, full duplex mode whenever possible.
- No fibre cable required.
- Fast Ethernet switch in the 22/F equipment room as the core of the LAN.
- Use two Cisco switches, 2950G-48 (48x 10/100BaseT, 2x GBIC slots) and 2950G-24 (24x 10/100BaseT, 2x GBIC slots) with GigaStack modules (support inter-switch 1G each direction), to form one logical core switch. It supports the required number of connections with 8 spare ports for future growth.
- Each physical switch has two GBIC slots with one occupied by a GigaStack module. The two spare GBIC slots enable easy upgrade by providing two 1G ports when such a requirement arises in the future, simply plug in 1000BaseT GBIC modules.

IP Address



Internal Network

- Internal network (inside of the firewall): 192.168.1.0/24, a private network address specified in rfc1918 (best current practice). 254 host addresses available, 192.168.1.1 – 192.168.1.254, more than required.
- Inside interface of firewall static address: 192.168.1.1.
- Other network equipment static host address: 192.168.1.2 – 192.168.1.15.
- Email server static address: 192.168.1.16.
- Other server static host address: 192.168.1.17 – 192.168.1.31.
- Network attached printer static host address: 192.168.1.32 – 192.168.1.47.
- User PC dynamic host address by DHCP (dynamic host configuration protocol): 192.168.1.128 – 192.168.1.254.
- Address range 192.168.1.48 – 192.168.1.127 reserved for future use.

External Network

- External network (outside of firewall): 201.20.30.0/29, a public network address allocated by the ISP.
- Inside interface of external router connecting to the ISP: 201.20.30.1.
- Outside interface of firewall: 201.20.30.2.
- Each publicly accessible server needs a public host address. 4 addresses, 201.20.30.3 – 201.20.30.6, are available.
- Address 203.20.30.3 is assigned to the email server because it needs to be accessible by external email systems from the Internet for email forwarding.

Network Address Translation (NAT)

- NAT performed by the firewall.
- Static translation inbound and outbound connections for the email server: private address 192.168.1.16; public address 201.20.30.3.
- Dynamic translation for the source address of outbound connection: private address 192.168.1.x (everyone in the internal network); public address 201.20.30.2 (outside interface of firewall).

Internet Connection

- Use ADSL to replace modem dialup, provide higher speed, 1.5M download and 512K upload, and permanent connection.
- The ISP provides the external router, the WAN side connects to the ISP using ADSL, the LAN side connects to the outside interface of the firewall.
- Use a Cisco PIX 506E as the firewall. It stands in between the ISP’s router and the company’s internal network.

- The PIX 506E is configured to stop all inbound connections except SMTP connection to the email server and IPSec VPN connection to the firewall itself.
- The PIX 506E is configured as the DHCP server for the internal network.
- The PIX 506E supports cleartext throughput of 100Mbps.

Remote Access Virtual Private Network

- The PIX 506E also supports remote access IPSec VPN termination.
- The PIX 506E supports 3DES IPSec VPN throughput of 17Mbps and up to 25 concurrent VPN peers.
- The lower model PIX 501 supports up to 10 concurrent VPN peers and does not meet the requirement of 20 concurrent connections.
- Address pool assigned to remote access VPN client. 192.168.2.1 – 192.168.2.254.

Support Service

- Requires Cisco 8x5x4 on-site support contract for PIX 506E firewall and 2950G switches in order to meet the requirement of 6 hour fault recovery.

Implementation Plan

- Finalise network design
- Budget approval
- Order equipment
- Install cabling system
- Install Cisco 2950G switches
- Test LAN
- Install Internet connection
- Install Cisco PIX 506E firewall
- Test Internet connection
- Migrate existing servers, PCs and printers to new network
- Implement new email system and internal web page

Chapter 7
Sample Coursework for Module D
Multimedia Production and Web Authoring

7.1 Chapter Overview

In this chapter, the discussions are based on six authentic scripts collected from different schools. The scripts are worked in response to the *2002 HKCEE Information Technology* coursework question set by the HKEAA. The question is as follows:

Digital Photo Album
A candidate is required to construct an album that serves as an archive for electronic copies of photographs.
The album should include the following functions :

- *input, organize and group photographs into the album*
- *add audio files into the album*
- *add titles and descriptions to each photograph*
- *select photographs for browsing and printing*

The coursework question on producing a digital photo album is chosen because it resembles the elective "*Multimedia Production and Web Authoring*" from the new *S4-5 Computer and Information Technology* curriculum. The six sample coursework are NOT used to demonstrate the level of attainment across different schools. In fact, these six scripts are presented to highlight different strengths and points to note in multimedia coursework. Students interpreted the requirements of this question differently which resulted in a variety of tools, like *Powerpoint*, *Frontpage*, *Access* and *Macromedia Director* being used to accomplish the coursework.

The assessment guideline used in the *2002 HKCEE Information Technology* is slightly different from that proposed for CIT, with fewer numbers of level descriptors. Though the same eight aspects were to be assessed, the sub-items were not as detailed as the ones proposed for the new *S4-5 Computer and Information Technology* courseworkby the HKEAA.

Views and comments expressed by teachers who participated in the CIT assessment training workshop are presented in Section 7.2. Before reading Section 7.2, an experience of using the products and reading the reports of the authentic coursework on the CD-ROM would enable a better understanding of different aspects of a multimedia coursework.

7.2 Discussion on Coursework for Multimedia Production and Web Authoring

N.B. Due to a difference in the nature of this elective module, several aspects may be grouped together for the purpose of discussion. Also, some other issues which could not be classified under the eight aspects will be highlighted in the other relevant sub-sections.

Objectives

1. Apart from MM5 where section A "*Assignment Introduction*" is missing, the other 5 reports state objectives in contextual terms. MM2 and MM4 are particularly strong in this, while MM1 and MM6 mention the reason for doing the project as objectives.

2. MM2 and MM4 also state the user requirements in the *Objectives*. Obviously the authors of MM2 and MM4 followed the assessment guideline closely.

3. It is more natural for students to "create" a context and then further elaborate the user requirements as part of the objectives in multimedia projects. It is in great contrast to the close-end programming question on *Apple Chess* game.

Analysis

4. In *Analysis*, students tend to justify why an IT tool is used. Perhaps most teachers have demonstrated a template of the solution, i.e. a sample of what the final product looks like to students and the students know what tools have been used to make the template. Therefore, students are keen to mention the tools used like *Powerpoint*, *Frontpage*, etc. immediately after the user requirements but without thinking of some alternative ways in tackling the problem.

5. Regarding the choice of IT tools, i.e. software used in realizing the multimedia product, students tend to list out as many possible tools that will/have been used, e.g. in MM1 the author even mentions the use of a Chinese input method!

6. Only in MM2 (Section B of the report) and MM4 (pages 3 and 4 of the report) do the students attempt to look for alternative ways of solving the problem.

7. Most students specify the hardware required. They think it is important as multimedia elements such as images, audio and video clips are usually large in size. Thus the choice of hardware and operating system are significant to ensure good performance.

8. MM1 lacks an overall plan in advance. It only states the process of accomplishing the project. MM2 and MM4 provide a flowchart/sitemap in the *Implementation* aspect, while MM3 and MM5 provide a flowchart/sitemap/structure as an independent aspect. It seems difficult for students to distinguish between *Analysis* and *Design* in multimedia projects. And the flowchart/sitemap/structure diagram in MM2, MM3, MM4 and MM5 needs improvement in order to conform to the standard way of presenting flowcharts/sitemaps/structure diagrams.

9. The interpretation of the question and the ability of the students are the two main factors affecting the choice of a suitable tool. Teachers had different opinions of the word "*function*" in the question. Some teachers thought that "*function*" meant that the product should allow users to add more digital photos. The authors of MM3 and MM6 interpreted it in this way and used *Access* and *Director* respectively to let users add photos in future. Similarly, MM1 and MM5 use *Powerpoint* which also allows the addition of photos by users. But it is more likely that the students' use of *Powerpoint* was limited by their ability in handling complicated software. MM2 and MM4 simply used the website to store data with no modifications allowed. This may be due to the fact that interactive server-client technology is not included in the IT curriculum. Teachers could not reach a consensus regarding whether bonus marks should be given to students who learn and use new software as in the case of MM6.

Design and Implementation

10. Most teachers agree that students should state their choice and the properties of the multimedia elements in the *Design* aspect, like MM2 (pages 6 and 7 of the report) and MM4 (pages 7, 8 and 18 of the report).

11. MM1 basically reports the whole process of what has been done. It seems that the student misunderstood that design and implementation is merely a record of which button to click in order to add a hyperlink. In fact, MM1 can be re-organized in a way that those processes, including improvements made after taking the teacher's advice, can be treated as *Discussion*.

12. MM2 and MM4 fit the assessment guideline in tightly. Perhaps it is the consequence of the training in report-writing offered by the same teacher beforehand. Both reports, however, exhibit a similar style without much variation. It will be difficult for the marker (i.e. the teacher) to rank the reports given a small spread of score.

13. The reports of MM3 and MM6 are like a user manual of some complicated products! MM3 and MM6 are more comprehensive in terms of functionality. For example, MM3 allows users to select size of photos to be printed and MM6 allows users to add audio clips of their own choice. It seems that the authors are eager to share his (MM3) and her (MM6) product, thus they consume a lot of pages to demonstrate to users how to play with their products. Most teachers agree that this is not what they expect. They thought that MM3 and MM6 can be re-organized in a way to highlight the "functionalities" of the products, rather than a user manual on how to install and run the product. This is because the "functionalities" are the strength of their projects and therefore should be focused on.

Testing and Evaluation

14. Most teachers agree that *Testing* and *Evaluation* are important in multimedia projects, especially the *Evaluation* part.

15. It is easy to report *Testing* in multimedia projects, for example, checking the hyperlinks and the time required to view a webpage full of multimedia elements, etc.

16. Regarding *Evaluation*, since most multimedia products are to be used by users, like a website which can be accessed by interested parties online, it is important to meet user requirements. MM1 uses a questionnaire survey to collect feedback from users, though some questions are not directly related to the *Design* and *Implementation* of the product (e.g. which pop star is more popular). Other reports are not very strong in terms of *Evaluation*. Being User-friendly and the aesthetic factors are valuable parameters collected from users.

Conclusion and Discussion

17. Improvements and further enhancements can be part of *Conclusion* and *Discussion*.

18. If the final product differs much from the original design, a discussion on the problems encountered and the reasons for the deviation should be included.

Other Issues

19. Since it is too easy for students to adapt/adopt multimedia elements from external

sources (e.g. midi files), so it will not be practical to ask students to create every multimedia element used in the product. Therefore, seeking permission to use copyrighted materials is an important learning experience in multimedia projects. In fact, value and attitude, which cannot be assessed in a paper-and-pencil test, are important aspects to be assessed in project work.

20. Though weak in other parts, MM5 is the best report in showing the importance of using copyrighted materials. In the Appendix of MM5, it records communication by email between the author of MM5 and the organisation in which the copyrighted clip arts belong to.

21. If students can plan well before starting the project, they should be encouraged to make some multimedia elements themselves in this day when the digital camera is popular. For example, in the *2003 HKCEE Information Technology* coursework, students could visit Chek Lap Kok Airport in the summer holiday and take photos of relevant facilities and transportation means if they were going to do a project on information kiosk system. An authentic experience of using existing facilities can inspire students to produce a sensible product or even add creativity.

22. Teachers and students should be reminded that in the present arrangement, reports contribute a significant weighting in the coursework. Many students may spend a lot of time in constructing the multimedia product and spare little time in report writing. Teachers should pay extra attention to those students who deviate a lot from peers in terms of selecting a relatively complicated tool. The author of MM6 has spent a considerable amount of time in learning *Director 8.5* prior to her project.

Executive Summary

Background

The new Computer and Information Technology (CIT) curriculum was first introduced to secondary schools in school year 2003/2004. Coursework assessment is brought in as a separate paper (Paper 3) in the public examination in order to assess attributes of students that are hard to be examined using the conventional paper-and-pen method. The deliverables of students' coursework include a product (if any) together with a written report. They are to be submitted to the subject teachers for school-based assessment.

A series of training workshops were conducted from January 2003 to March 2004 in order to equip and acquaint CIT teachers with skills to supervise students' coursework, including how to facilitate the development of students' coursework and how to mark the products/reports. More than 600 teachers attended the workshops. During the workshops, teachers examined different drafts of assessment guidelines and samples of students' coursework. Ideas about coursework assessment were extensively exchanged.

This executive summary summarizes the key ideas expressed in this report which is in itself a digest of the training and the discussion involved.

A. Teachers' General Views towards the Introduction of CIT Coursework

1.1 Overall Feeling

- The introduction of the Computer and Information Technology coursework is a positive move.
- The coursework can foster students' active learning and sense of ownership.
- Students will generally find coursework difficult to handle and need guidance from teachers.
- Teachers will also gain new knowledge through the coursework.
- Teachers' role primarily is to help students do the best they can.
- Students will learn to look for useful/relevant information.
- Students will generally develop deeper understanding through coursework.

1.2 Possible Strategies for Success

- Stimulating and motivating the students being a key issue
- Some systematic teaching of the relevant basic skills first
- Leading students through a simpler project first
- Structuring the process into phases
- Letting students try something on their own first and responding to their problems latter
- Providing individual guidance or group tutorship in regular coursework lessons
- Leaving some space for students to try out their own ideas

B. Teachers' Concerns towards CIT Coursework Assessment

(1) Conflict between Teaching and Assessment as well as Fairness among Students

1.1 Tension between the conflicting roles of teachers in being a teacher and an assessor at the same time.

- Teachers' provision of leading questions and innovative ideas that stimulate students to think more deeply and more creatively about the coursework should not be seen as cheating.
- It is of paramount importance to view the coursework as a learning process and not solely as an examination process. The aim is to achieve assessment for learning, i.e. something to promote learning not something that inhibits learning. Students should not be penalized for asking questions. On the contrary, teachers should consider rewarding them.
- Helping students to understand and correct their errors is a very important part of the process. Teachers' input is very valuable all along.

1.2 Setting up a Baseline

- Teachers agree that a basic level of attainment expected of students is important. Basing on these expectations, teachers can plan their teaching such that students will generally be able to do the basics of the coursework, while leaving them enough room for further exploration and enhancement.
- For students who are weak and have difficulty in reaching the basic expectations, teachers may need to provide more help.
- For students who are more capable, teachers may urge them to explore more by themselves.
- This is what a sensible teacher would do and should not be seen as unfair practice.

(2) Assessment Criteria and Inter-School Variability

2.1 What Aspects to be Assessed

- Teachers can draw up a list of sub-items for their students based on the HKEAA assessment guideline.
- Teachers can select those that are most relevant to their students and to the specific coursework in hand. They should re-word the assessment guideline in more specific terms related to the problem so that the students can understand and use the guideline as an indication of the directions/areas they should pay attention to and try to do their best.

2.2 Level Descriptors

- The level descriptors like ‘brief’, ‘complete’, ‘clear’ is difficult to define in an a priori manner. It would usually be the time when the coursework is nearly done or partially finished that teachers would be able to give more specific meanings to these qualifiers, basing on the variation among students.
- Teachers generally agree that they should collectively inspect samples of students’ work submitted first, before they finalize a consensus on their standard of marking.

2.3 Product, Report and Process

- The quality of the product can reflect a student’s understanding of the problem and his/her capability to solve it. The product should be considered together with the report in judging a student’s attainment.
- ‘Process behaviour’ includes items like handing in progress reports on time, good self-initiatives in searching for information on their own, and so on.

2.4 Interschool Variability

- Schools can make the maximal use of the range of marks to mark the difference in effort and achievement among their students, as the mechanism of statistical moderation according to the written paper scores will be in place.
- Teachers can help students contextualize, adapt, or add focuses to the coursework questions posted by the HKEAA, so that they become more meaningful, familiar, or unique to their own students.

(3) Variability among Coursework related to Different Elective Modules

3.1 Common Views among Teachers

- The coursework related to the four different elective modules differ in nature.
- It is difficult to arrange the scores of students with four different kinds of work into one high-low queue in a valid and fair way.
- Teachers should be given the freedom to rearrange the marks in each category. (e.g. Objective (8%) and Analysis (12%) for Apple Chess coursework while Objective (10%) and Analysis (10%) for Networking coursework).

(4) Plagiarism

4.1 Appropriate/Inappropriate Use of Information/Resource

- There is a need to distinguish what is appropriate from what is inappropriate, and help students understand this concept in the first place.
- Teachers can make known as much as possible any useful third party references that is found on the Web, and support a positive way of building up such information/resources if necessary for encouraging appropriate use.
- If the purpose of the coursework is to learn to write programs, then the copying of a program that meets the user requirements (e.g. playing the apple chess) will take away the need of the student to do the programming, and hence is clearly inappropriate. However, if the purpose is to demonstrate the appropriate use of multimedia effects in showing or linking information in a presentation, then the use of a third party's code, or picking an easy-to-use tool to generate such effects should be seen as appropriate.
- In any event, proper acknowledgement of such usage is required so that there should be no hiding of the use of third parties' information and resources.

4.2 Copying among Students

- Teachers should inspect progress of students regularly during working sessions.
- Some part of the work like the writing of the parts on 'objectives' or 'analysis' can be done like class work, or even like quizzes in regular lessons, after some preceding discussion has been done.
- Teachers can adapt the coursework problem so that students will not be able to simply take something 'on the shelf' provided by publishers or tutorial schools without the need to do any original thinking.
- Teachers can arrange oral presentation by students about their products and take questions on the spot.

C. Issues relating to CIT Coursework in Different Phases

(1) Interpretation of Questions and Selection of Questions

1.1 Teachers' Role

- Interpreting the requirements of the coursework for the sake of giving proper guidance and agreeing upon mutual understanding between him/her and his/her students
- Defining requirements that specify what the proposed system is to include (e.g. Networking coursework: identify user(s), users' needs, advantages of the new system, functional units and operations to perform, etc.)
- Making conjectures about the level of difficulty of the coursework question
- Asking students to do some research on the topic first and encouraging/arousing students' discussion on requirements such as defining users, functions, rules of the purposed systems, etc. (This will give students a greater sense of ownership and a greater incentive to carry out the coursework.)
- Giving feedback, comments, directional guidance to students whenever appropriate even after students have drawn up their own specifications of the proposed coursework
- Alerting a student the risk of encountering obstacles and limited help if s/he chooses a coursework which is too ambitious
- Advising students on possible use of software/hardware.

1.2 Students' Role

- Select an appropriate coursework on their own which is **achievable** according to their interest, aptitude and ability and basing on the guidance of teachers.

(2) Planning

2.1 Drawing up Specifications

- Teachers should ask students to draw up a specification of the proposed coursework, together with a table of content and a work schedule for their comments.

2.2 Dividing the Coursework into Stages

- The coursework is supposed to be done over a period of time and NOT to be rushed in the last month or even week.

- Each student and their teacher should therefore agree upon a reasonable individual schedule.

2.3 Setting up Milestones

- This help students to have a better time management.
- This prevent students from dragging on when encountering obstacles which lead to insufficient time in writing up the report.

2.4 Template versus Seed Ideas

- Some teachers feel more comfortable to prepare a template for students to follow because
  - some students may lack the ability to foresee how the final product looks like.
  - the school may lack a variety of software/hardware for developing the products.
- Some teachers may present several seed ideas to students and lead them through a thinking process in developing their specifications. The seed ideas can be
  - different scenarios of the coursework
  - related examples
  - sources of information
  - an evaluation of some existing solutions

2.5 Collaboration among Students

- Teachers may help students who choose the same coursework to form cell groups in order to brainstorm and share ideas.
- Teachers generally think that sharing of ideas does not mean direct copying. They can still separate the sheep from the goats.

2.6 Pre-training

- Teachers can do some pre-training through mini-projects before students really start the coursework.

2.7 Knowing the Assessment Criteria

- Teachers should let students know the assessment guideline before they start the coursework.
- Teachers can modify and add descriptors to assessment criteria in order to suit the coursework of different elective modules.

(3) Implementation

3.1 Collection of Data/Information

- The data/information collection stage may involve reading books and magazines, searching on the Internet and relevant CD-ROMs, as well as site visits.
- In collecting data, evidence of asking for copyright should be kept and documented in the report, e.g. by including the communication record like the email printout into the report as appendix.

3.2 Keeping a Log Journal

- Teachers should encourage students to record their progress on a log journal. Teacher can sign against each completed stage if students can provide evidence of finished parts.
- The log can be added to the report as evidence of going through a developmental process.
- The log can also help students to recall what have been considered during the analysis, design, implementation, evaluation and testing stages, and help students to write up the final report.

3.3 Use of Resources

- Teachers are expected to give directional guidance to students but should refrain from telling students specific technical details as far as possible.
- If a teacher is not familiar with a tool, then the student can be encouraged to explore using the Help or user manual provided by the tool, or seek information about the tool from the Internet. Alternatively, the student and the teacher can explore the use of other tools together.

3.4 Use of Lesson Time

- The 10-hour contact time stated in the new S4-5 Computer and Information Technology curriculum guide is not meant for indicating the total amount of time needed by students to do coursework. They are for encouraging interaction between teachers and students.
- Teacher may set aside certain periods to discuss with the whole class their coursework at each stage and review the progress.
- Different students attempting the same coursework may encounter similar difficulties. Teachers may make us of these opportunities to discuss the problems with students and this can be seen as part of the learning process.

3.5 Interim Review

- Teachers may request students to report verbally his/her work at regular time intervals
  - to judge whether s/he is really doing the coursework in his/her own effort at each stage
  - to allocate a certain score as “process mark”
  - to give feedback to substantiate assessment for learning
- Giving feedback also serves to
  - let a student know whether s/he is heading in the correct direction
  - let the student know whether his/her pace is appropriate
  - let the student know whether any parts need to be strengthened
  - encourage students to achieve the highest level of attainment that they are capable of

(4) Cheating

4.1 Deterring Cheating

- Preventive measures are more effective than remedial ones.
- Teachers should let students know clearly the consequences of being found cheating.
- Teachers can make use of the CORD strategy.
  - Emphasizing the *Culture* of honesty - Self-respect and being proud of a coursework accomplished on his/her own being an important attribute of the coursework
  - *Observing* the overall quality of the coursework submitted - Most teachers think that they know the student well and are able to spot out any part(s) that is/are completed in a level beyond the student’s ability or style
  - Interim *Review* of progress - Setting up milestones makes it difficult for students to cheat
  - *Discussing* with student to check for reality - Asking questions on different parts of the coursework to test whether the student really understand what has been done, or withdrawing certain parts out of the coursework and asking the student to re-fill the gap in front of the teacher within a reasonable time limit

(5) Evaluation

- Teachers may encourage students to ask friends, students from other classes, relatives or parents to trial run their product before submission.
- After students have submitted their products, teachers may arrange several special

occasions for students to present their coursework, and through a question-and-answer session allow students to receive comments from peers. The peers' comments are only allowed to be put in the report as further improvement.

(6) Report Writing

6.1 Documentation

- Teachers generally agree that sometimes it is difficult to give segments to the report as clearly as proposed in the assessment guideline. What matters most apparently is the ability of students to express all necessary details in an organized structure during a system development process.
- Teachers should encourage students to arrange the report into two parts: the main report and the appendices. The main report should describe the development and learning processes concisely. Students should make use of the appendices to provide further/supplementary information.

6.2 Coursework Exemplars

- Teachers generally agree that exemplars with illustrations on what are expected in a report are of paramount importance. A discussion of these exemplars will be a good learning experience to students.

6.3 Interim Report

- Some teachers prefer to ask students to submit interim reports so that feedback can be given as necessary. This prevents students from straying away from writing unstructured and insensible reports. This practice also allows students to improve the report parts by parts based on the comments given by the teacher.
- Some teachers may prefer setting a report submission deadline earlier than the one set by the HKEAA to give allowance for further editing if deemed necessary.

(7) Marking

7.1 Scoring for Level Descriptors

- Some teachers think that level descriptors should be written in great details and the students' coursework scored accordingly so as
  - to enhance fairness in marking
  - to justify the marks given
- Others think that marking according to given level descriptors are too mechanical and flexibility should be allowed. They prefer to use a flexible assessment

guideline similar to the one used in marking the 2002 HKCEE IT coursework (i.e. the breakdown of the scores is only up to the level of major sub-items under each aspect).

7.2 Weighting of Aspects

- Due to different nature of elective modules, teachers generally feel that they should be allowed to exercise their own judgment on the weighting of each aspect within the same category provided that all aspects add up to the percentage allocated to that category. For example, for the "Algorithm and Programming" elective module, some teachers think that as the development of the Apple Chess Game is a close-ended question, less marks should be given to the "Objectives" aspect while more marks should be assigned to the "Analysis" aspect.

7.3 Ways of Marking

- Since the HKEAA requires schools to do internal moderation before submitting a fair queue on students' performance, standardization amongst teachers within the school should be made.
- Ways of performing internal standardization includes:
  1. Teachers can sample several coursework from different groups of students randomly. After marking the samples individually, they come together to reach consensus on the standard of the samples. The teacher then marks the coursework from his/her own group based the agreements made. No more moderation is done afterwards.
  2. Each teacher marks coursework of his/her own group. Comparison of samples of "High", "Medium", "Low" standards between different groups can be carried out to check whether adjustment of marks should be done.

7.4 Product Mark and Process Mark

- In case the product produced by a student is incomplete or not-workable, some teachers think that "process mark" can be given for
  - steady progress maintained
  - work according to schedule
  - showing initiation and responsible attitude

7.5 Language used in the Coursework

- The language medium of the coursework Report should be the same as that of the written examination (CIT Paper 1 & 2).

- However, students should choose a language medium that best fits the nature of the coursework product (e.g. a user-friendly interface is usually bi-lingual or even multi-lingual).

Appendix 3

General Weaknesses amongst Students in their Conduct of Coursework Study

Objective and Analysis

- Unaware of/giving insufficient attention to understand the real meaning of the question (e.g. upgrading *their* personal computers, not a survey on the possible upgrading methods)
- Giving insufficient attention to the meaning/spending insufficient time exploring the definition of key terms used in the given assignment (e.g. *medium-sized trading* company)
- Unaware of the need to define his own scope when the question was more open-ended and when there was a need to do so (e.g. the purpose of performing a computer upgrade)
- Unaware of the need to define a realistic and manageable scope
- Unaware of the need to justify the identified scope and explain clearly why the identified scope was meaningful and important
- Incapable of identifying clearly the target users or the user requirements (e.g. one player or two players in the *Apple Chess* game)
- Unaware of the need to make reference to any presumed or assumed current conditions in defining the user requirements (e.g. current configuration in performing a computer upgrade)
- Incapable of expressing clearly and concisely the justifications for any identified scope and user requirements
- Inconsistency between the objectives identified and the analysis made
- Incapable of making analysis from different perspectives (e.g. the available *methods* for solving a problem, the available *tools* for developing the solution, etc) and proposing alternative solutions accordingly
- Using general statements in the analysis and incapable of making analysis in accordance with the contexts specified
- Incapable of summarizing the analysis to formulate a chosen solution
- Giving only subjective viewpoints or take-it-for-granted statements instead of concise and sound arguments regarding the choice of the solution (e.g. the performance of a switch was better than a hub, the most common operating system used nowadays is Microsoft Windows XP Professional Edition, etc)
- Insufficient use of factual data (e.g. actual costs of hardware or peripherals) to support the arguments in explaining the choice of the solution

Design and Implementation

- Inconsistency or lack of sufficient coherence in the design (e.g. upgrading only the sound card without upgrading the speaker systems)
- Relying only on either text or diagrams to explain the design/unbalanced use of text and diagrams for explanation/illustration
- Using borrowed diagrams instead of self-constructed ones to illustrate the design pertaining to the specific contexts
- Insufficient elaboration on key concepts or key features employed (e.g. using an *application-specific firewall* to prevent hacking)/design of the solution not built upon prior knowledge gained through the CIT curriculum
- Indiscriminate use of borrowed text
- Use of symbols and abbreviations that were not properly explained or referred to (e.g. WEP-1 in networking)
- Inadequate analysis of the problem and the possible solutions in previous sections leading to poor focusing in discussing the design of the solution (That is, a substantial amount of the writing up in the section on Design was still spent on justifying why certain methods or tools were employed.)
- Inflexible treatment regarding the analysis of the problem and the design of the solution (That is, if the problem is more or less close-ended and there cannot be much variation in the ways of solving the problem, there should be less need for a detailed analysis. More effort should be put on designing and implementing a beautiful and reasonable/appropriate solution. On the other hand, if the problem is more open-ended, more emphasis should be put on analyzing the possible solutions.)
- Incapable of managing the resources to implement the solution wisely (e.g. spending too much time improving the graphics when the band width is a major concern, improper use of sub-routines/procedures to simplify programming)
- Recording merely the steps involved in implementing the solution without an elaboration on the difficulties encountered, the solutions employed, or any outstanding issues remaining unresolved, etc
- Inflexible use of the design and implementation process (That is, students should be aware that at times a solution is developed through several iterative cycles, with results from a certain implementation providing feedback to improve the design which leads to better results. They can then improve their design and implementation as far as possible using the available resources.)
- Merely designing and implementing the solution without the awareness to develop the required documentation for others to follow up/know more about the solution (e.g. a concise user manual)

Testing, Conclusion and Evaluation

- Incapable of performing a comprehensive testing of the implemented solution (e.g. unaware of the fact that the successful running or implementation of a solution is only one of the ways of testing the solution)
- Incapable of constructing the acceptance test in accordance with the established user requirements
- Incapable of performing tests that are representative, objective and reliable (e.g. using only a few peers' views to evaluate the attractiveness of the design of the web pages; relying purely on subjective judgments in rating the number of photographs collected as "Very Many", "Many", "Enough" and "Inadequate"; etc)
- Recording merely the test results without further elaboration on their meanings and implications
- Indiscriminate use of testing data, in particular the quantitative ones, in the interpretation (e.g. in upgrading the 20G hard disk to a 60G one, the *space for the storage of information* is increased three times)
- Unaware of the fact that the testing and evaluation can be made more meaningful by making reference to established data
- Evaluating merely the results of the implementation without evaluating the learning process itself
- Reporting only the weaknesses without sufficient elaboration on the strengths or vice versa
- Incapable of making suggestions for further development or enhancement based on the evaluation

Discussion and Documentation

- Incapable of expressing themselves clearly and concisely (e.g. when to use tables, charts, lists, etc)
- Inconsistent use of terminology
- Incapable of organizing the contents logically (e.g. improper numbering of sections, using different attributes to organize/categorize the elements in the same chart)
- Incapable of documenting the work properly (e.g. the absence of a table of contents, the absence of relevant reference lists or reference materials intermingled with the main text instead of being set aside as appendices, etc.)
- Incapable of acknowledging the origin of borrowed resources properly
- Improper proof-reading
- Improper use of word-processing skills (e.g. improper page formatting, font size, poor sizing of inserted graphics, inappropriate use of page break or section break, etc.)

Appendix 4

Different assessment guidelines used in training workshops for the CIT curriculum that were run from January to July 2003

1. Coursework assessment sheet for the 2002 HKCEE Information Technology Paper 3, HKEA

2. Draft (as at 14 December 2002) assessment guideline for the 2005 HKCEE Computer and Information Technology Paper 3, HKEAA

3. “Another possible way of marking” for reference, HKU

HONG KONG EXAMINATIONS AUTHORITY

HONG KONG CERTIFICATE OF EDUCATION EXAMINATION

INFORMATION TECHNOLOGY PAPER 3

COURSEWORK (exemplar material)

Coursework Assessment sheet

Assessment Criteria	Marks
Objectives of the Assignment (10) ➢ *description of the problem and the situation* ➢ *identification of the requirements of the users*	
Investigation and Analysis of the Problem (10) ➢ *consideration of alternative ways of solving the problem* ➢ *justification of the choice of appropriate IT tools*	
Design of the Solution (10) ➢ *overview of the solution in the design* ➢ *comprehensive description of the design including file formats & user interfaces*	
Implementation of the Solution (25) ➢ *Resources* ➢ *Data collection, capture and input* ➢ *Data verification and validation* ➢ *Data and program structures* ➢ *Output Format*	
Testing and Evaluation (10) ➢ *testing of the solution according to defined testing plan* ➢ *evaluation of the effectiveness of the solution*	
Conclusion and Discussion (10) ➢ *conclusions drawn from the implementation process* ➢ *suggestions of improvement and further development*	
Documentation of the Solution (10) ➢ *neatness and sensible choice of presentation* ➢ *effective use of text and illustrations* ➢ *acknowledgement of all sources of assistance*	
Creativity (15) ➢ *creativity in making the design* ➢ *creativity in the implementation process*	
Total Marks	

DRAFT
Updated at 14 December, 2002

Hong Kong Examinations and Assessment Authority
Hong Kong Certificate of Education Examination 2005
Computer and Information Technology
Coursework (Paper 3)
Assessment Guidelines

The coursework assessment emphasises the testing of understanding, the practical application of knowledge and the use of processing skills. Hence, the use of this assessment guidelines or anything else which encourages rote memorisation, should be considered outmoded and pedagogically unsound. The assessment guideline should not be used as the only way to assess students' work.
課程習作評核指引是爲老師作評核參考之用，老師不應視此爲標準及唯一方法，使學生以致但知硬背死記，活剝生吞。這種落伍的學習態度，既不符現代教育原則，亦有違課程習作着重理解能力與運用技巧之旨。

			Marks
Objective			
Give a description of the coursework.			
■ Give brief details of the problem and the situation ■ Identify some requirements of the intended users ■ State the sub-problems	■ Produce a complete description of the problem and the situation ■ Clearly identify the requirements of the intended users ■ Clearly identify the sub-problems	■ Produce clear, accurate and reasonable description of the problem and the situation ■ Clearly describe appropriate sub-problems and the links between them ■ Identify and explain the requirements of the intended users ■ Demonstrate thorough understanding of the key concepts in the problem	
1 – 4	5 – 7	8 – 10	
Remark:			

Analysis			
Describe details of the equipment and techniques used and explain the choice of methods.			
■ State an alternative way of solving the problem ■ State the choice of IT tools supported by some reasons	■ Identify and describe an alternative way of solving the problem ■ Clearly describe the choice of IT tools ■ Indicate a comprehensive usage of the selected IT tools	■ Identify and evaluate one or more alternative way of solving the problem ■ Produce clear comparisons of different IT tools ■ Justify the choice of IT tools using appropriate terminology ■ Provide sound reasons for the choice ■ Demonstrate a good understanding of the strengths and the weakness of different ways of solving the problems	
1 – 4	5 – 7	8 – 10	
Remark:			

Design			
Give a description of the design for the solution of such problems.			
■ Outline a design of the solution ■ Attempt to establish a link between all different parts of the solution	■ Produce a clear and reasonable description of the design for the solution ■ Identify the relationship between the essential parts of the solution	■ Produce a comprehensive, concise and appropriate description of the design for the solution ■ Justify the design based on supporting theory such as calculations and formulae ■ Accurately identify the relationship between all different parts of the solution	
1 – 4	5 – 7	8 – 10	
Remark:			

Implementation		
Demonstrate results and evidence in the implementation process.		
Resources ■ Use resources with some skills *Data/information handling* ■ Bring an awareness of data/information collection, capture and input ■ Bring an awareness of data/information verification and validation ■ Collect data/information with some relevance to the problem *Data/information/program structure* ■ Specify the Data/information/program structures *Output format* ■ Create an output format that can be partially tested as a solution to the problem	*Resources* ■ Use resources with skills and understanding *Data/information handling* ■ Produce some concise work on data/information collection, capture and input ■ Adopt some concise procedures on data/information verification and validation ■ Collect relevant and reliable data/information *Data/information/program structure* ■ Produce good quality of data/information/program structures *Output format* ■ Create an output format that can be tested as a solution to the problem	*Resources* ■ Demonstrate effective skills in the appropriate use of resources ■ Demonstrate a good understanding of resources *Data/information handling* ■ Produce concise and necessary work on data/Information collection, capture and input ■ Adopt concise and necessary procedures on data/information verification and validation ■ Collect reliable data relevant to the problem under consideration ■ Demonstrate a good understanding of the necessary techniques of data/information handling in the problem *Data/information/program structure* ■ Create clear, effective and efficient data/information/program structures *Output format* ■ Create an appropriate output format that can easily be tested as a solution to the problem
1 – 10	11 – 18	19 – 25
Remark:		

Testing & Evaluation			
Perform testing and evaluation of the solution of such problems.			
■ Record some test results ■ Produce few description of the evaluation	■ Record most of test results according to the testing plan ■ Describe the effectiveness of the solution relative to the original problem	■ Record all test results according to the testing plan ■ Evaluate the test results against the expected outcomes clearly and accurately ■ Demonstrate a comprehensive methodology in testing and evaluation	
1 – 4	5 – 7	8 – 10	
Remark:			

Conclusion & Discussion			
Draw a conclusion related to the objectives and consider the limitations. Make suggestions for the solution of such problems.			
■ Draw a conclusion with some reasons ■ Suggest few improvements to the solution ■ Bring an awareness of the further development	■ Draw a conclusion by referring to evidence collected ■ Reflect the student's learning process ■ Suggest some good improvements to the solution ■ Discuss the further development of the solution	■ Draw a concise and accurate conclusion from the implementation process ■ Reflect the student's learning process effectively ■ Suggest and explain improvements made as a consequence of testing ■ Demonstrate a clear and comprehensive understanding of the solution in further development	
1 – 4	5 – 7	8 – 10	
Remark:			

Documentation			
Produce a summary report of the coursework. Sources of assistance including materials and persons consulted must be included.			
■ Produce a fair document with text and illustration ■ Acknowledge few sources of assistance ■ find a number of mistakes in spelling, punctuation and grammar	■ Produce a document with a comprehensive and sensible style ■ Generally demonstrate accuracy in spelling, punctuation and grammar ■ Use text and illustrations effectively ■ Acknowledge the essential sources of assistance ■ Express ideas and visions successfully	■ Produce a document with a good writing style and appropriate terminology ■ Demonstrate effective skills in the appropriate use of text and illustrations in detailed instructions in the document ■ Acknowledge all sources of assistance ■ Well organise and present the objectives and original thought	
1 – 4	5 – 7	8 – 10	
Remark:			

Creativity			
Demonstrate the ability to produce original ideas, or to make something new or imaginative.			
■ Design and implement a solution very similar to (or even the same as) an existing solution ■ Produce a plain design of the solution	■ Provide some new ideas in analysing the problem and/or designing the solution ■ Aware the user-friendliness of the solution	■ Provide some fresh ideas in analysing the problem ■ Demonstrate an imaginative use of IT tools in the solution ■ Create an innovative design of the solution ■ Produce templates, macros and so on for users (if any) to improve the effectiveness and efficiency ■ Demonstrate a good use of presentation techniques ■ Demonstrate personal responsibility regarding research and attitude	
1 – 5	6 – 10	11 – 15	
Remark:			
		Total:	

Overall comment:

Another possible way of marking			marker ID	
Step one: choose items that are applicable and adapt its content if necessary; tell students about the items before they do the project				
Step two: After the student has handed in the work, look at the product and the report and judge how well have he/she achieved on each item: A well achieved / B achieved / C partially achieved / F not achieved				
Step three: decide the overall score of each of the 7 major aspects, based on a holistic judgement on the level of achievement on the applicable items				
		applicable?		
general	apple chess prog	cptr upgrade	network proposal	multimedia
1. Objective: tell people what you want to achieve and why (10 marks)				
1.1 state background context, needs,	(yes)	yes	yes	yes
1.2 state current difficulties without the use of IT	(yes)	yes	yes	yes
1.3 state purposes & benefits of the project	yes	yes	yes	yes
1.4 state target user, situation of use	yes	yes	yes	yes
1.5 state user requirements and scope of project	yes	yes	yes	yes
2. Analysis: tell people what does it involve and what sort of resource/method(s) you would use to address these problems (10 marks)				
2.1 discribe understanding of the problem: identify key subproblems	yes	yes	yes	yes
2.2 explore possible alternative approaches or IT resources for solving the problems	yes	yes	yes	yes
2.3 indicate the approache(s) or IT resources to be used in the project	yes	x	x	yes
2.4 explain the criteria of the selection (strengths and weaknesses of the alternatives)	yes	yes	yes	yes
3. Design & implementation: produce the product / solution reuqired and give people an idea about how you create it (35 marks)				
3.1 report about the information collection necessary for creating the solution	(yes)	yes	yes	yes
3.2 describe the overall plan or structure of the solution, with indication of its major parts	yes	yes	yes	yes
3.3 describe the major parts involved in the solution (and their relations with others when applicable)	yes	yes	yes	yes
3.4 describe problems arising in implementation and how they are dealt with	(yes)	(yes)	(yes)	(yes)
3.5 complete a product / proposal / design / solution meeting the functional requirements (18 mraks)	yes	yes	yes	yes
3.6 provide suitable input and output formats or interfaces	yes	x	x	yes
3.7 provide suitable handling of invalid data, inputs, or exceptional situations	yes	x	x	yes
3.8 Does the solution demonstrates the application of relevant key knowledge, concepts in the module, and skills in using the I.T. resources?	effective use of the lang, well struc prog, data structure, alogorithm, objects, events,..	major functional units, configuration, bus, ports, peripherals, o/s, drivers, standards, performance factors…	major components, protocols, tools & services, topology, security, management, performance…	information organisation, layouts, navigation, controls, media capture and processing, assess performance …
4. testing and evaluation: tell people how the product can be or has been evaluated (10 marks)				
4.1 describe the test plan	yes	yes	yes	yes
4.2 report the result of the testing done by the developer / users	yes	x	(walkthrough?)	yes
4.3 make judgement about the correctness or errors based on the testing	yes	x	x	yes
4.4 evaluate by comparison against other solutions observed, if possible.	(yes)	(yes)	(yes)	(yes)
5. Reflection and discussion: discuss what you have achieved / learnt (10 marks)				
5.1 state whether the reqirements have been achieved, and if not, how improvements can be made	yes	yes	yes	yes
5.2 mention some insights gained on learning about how to learn/solve problems	yes	yes	yes	yes
5.3 mention knowledge discovered which is relevant for other people on similar projects in the future	yes	yes	yes	yes
6. Quality of the report (10 marks)				
6.1 does the document alllow readers to know how the product is like and how to use it?	yes	yes	yes	yes
6.2 does the document allow readers to understand the method of creating the product?	yes	yes	yes	yes
6.3 does the student use language and illustrations effectively in the report?	yes	yes	yes	yes
6.4 does the student acknowledge sources of assistance and resources used?	yes	yes	yes	yes
7. Creativity and Process behaviour (15 marks)				
7.1 does the student proivdes creative and innovative content / features that enrich the quality of the product? creative ideas that lessen the complexity of the problem, or the amount of resources needed to achieve the purpose? point out with sound justifcation important criteria that others don't generally see?	yes	yes	yes	yes
7.2 Has the student been able to keep a steady progress, and work according to schedule?	yes	yes	yes	yes
7.3 Has the student demonstrated outstanding personal initiation and responsibility regarding research and learning?	yes	yes	yes	yes