COMPUTER STUDIES IN QUEENSLAND SENIOR SCHOOLING

INTRODUCTION

Note on terminology

Terminology is so difficult to use when audiences have preconceived understandings of terms. Usually computer studies is a general term which refers to all subjects of study in school, where information technologies and related sciences are the focus of study. In the Queensland context, however, the term ‘Computer Studies’ is reserved for one of the study area specifications available for Queensland schools. This article will use the term ‘Information Technology studies’ as a general term to include all syllabuses available in Queensland.

The Queensland Board of Senior Secondary School Studies (QBSSSS) is responsible for developing and approving subject syllabuses for use by schools in teaching students in Years 11 and 12. The subject offerings are classified as either Board subjects or Board-registered subjects. Board subjects are those that are considered in the calculation of the Overall Position (OP) which is used for tertiary entrance. Board-registered subjects currently are not considered in tertiary entrance procedures but are developed and managed to a limited extent by the Board. This report to describe Queensland’s situation will explore both types of subjects.

There are at present two Board subjects offered in the information technology studies area. These are Information Processing and Technology (IPT) and Information Technology Systems (ITS). The Board has also developed a group of Board-registered subjects collectively described as the Study Area Specification in Computer Studies.

All of the IT syllabuses seek to develop and promote problem-solving skills using applications of Polya’s problem solving algorithm. They have been successful because they have been able to identify concepts and principles that remain relevant over time, such as problem-solving algorithms and design methodologies that promote structured solutions to problems.

The following table shows examples of applications of Polya’s algorithm in the syllabuses.

<table>
<thead>
<tr>
<th>Polya’s problem-solving algorithm</th>
<th>Design - develop - evaluate cycle</th>
<th>Software development cycle</th>
<th>Information literacy cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Define the problem</td>
<td>• Design</td>
<td>• Problem identification</td>
<td>• Problem identification</td>
</tr>
<tr>
<td>• Plan a solution</td>
<td></td>
<td>• Solution specification</td>
<td>• Solution specification, eg.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Selection and application of appropriate design methodology</td>
<td>• genre, medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Selection and application of appropriate research</td>
</tr>
<tr>
<td>• Implement the solution</td>
<td>• Develop</td>
<td>• Implement the design</td>
<td>• Develop the product</td>
</tr>
<tr>
<td>• Look back</td>
<td>• Evaluate</td>
<td>• Evaluate the product and/or process</td>
<td>• Check for errors, eg. errors in fact, spelling, functional grammar</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Check for flow of communication</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Evaluate the product and/or process</td>
</tr>
</tbody>
</table>
Documentation is seen as an integral part of the problem solving process.

The syllabuses reject narrow skills based approaches that focus on gaining expertise in particular versions of software applications. By focusing on overarching principles, the IPT syllabus, for example, remains as relevant now, after a minor revision in 1998, as it was when it was implemented in 1991.

**DEMOGRAPHICS**

Information technology subjects have experienced growth in both the number of schools that offer them and the number of students electing to study them over past years. The overall increase, however, has not been in the same proportion for boys and girls. The tables below show the number of schools offering each subject and the mix of boys and girls over the years. It is noticeable that increasingly over the past six years, girls have elected to study subjects other than core IT subjects.

Anecdotal reports indicate that girls may be opting for Business and Legal courses rather than core IT studies. There seems to be a perception in society at large that IT is for those (boys) who are ‘good at playing computer games’. These boys enter IT courses with a substantial amount of background knowledge that is perceived to give them a head start and this may be influencing some girls not to study the subjects.

An interesting feature of the data is the apparent success rate of the girls who study core IT subjects. An example of this is shown in the table above.

From this, it can be seen that, in general, the girls who have chosen to study IPT have been successful at it. And over time, as a group, they have been increasingly more successful than their male counterparts. There is obviously room for more girls to study IPT and there is great potential for them to have success at it.

Anecdotal reports suggest that some boys who elect to study IPT do so in the misconception that it is a very practical course with a high degree of usage of software applications. These boys do not respond well to the important aspects of the course especially planning and documenting solutions to problems, and thus do not achieve as they expect.

There are some questions to be answered with regard to the subject choices of both girls and boys. Are girls who study IT subjects just good at matching their interests and abilities with the subjects on offer? Do girls and boys have sufficient opportunity in the junior school to become aware of what IT studies is about? Do girls have misconceptions of IT studies as boys apparently do? That is, are some girls not choosing IPT for the wrong reasons and are some boys choosing IPT for the wrong reasons?

**DESCRIPTIONS OF ACTIVITY**

**Information Processing and Technology (IPT)**

IPT is a Board subject. It contributes to tertiary entrance. There are no prerequisites to the study of this subject apart from successful completion of Year 10. It is a complex theoretical subject that draws from information and computing science as well as communication studies. The core topics are information systems, algorithms and programming, artificial intelligence, computer systems and consideration of the social and ethical issues associated with information technology.

Seventy-five percent of the course is prescribed core, and schools select extension material from at least two of the five topics to make up the other 25% of the course. This is described by schools in a schools’ work program, which is a legally binding document which sets out the course of study intended by the school, the assessment program and specific subject matter and objectives selected by the school from the syllabus.

The syllabus is drawn mostly from Information Science and so about half of a course of study will focus on information systems modeling. Queensland’s IPT

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**BOARD SUBJECTS**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Year of Exit</th>
<th>Schools</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Processing and Technology</td>
<td>1994</td>
<td>176</td>
<td>66.5</td>
<td>33.5</td>
<td>3101</td>
</tr>
<tr>
<td></td>
<td>1995</td>
<td>188</td>
<td>66.3</td>
<td>33.7</td>
<td>3360</td>
</tr>
<tr>
<td></td>
<td>1996</td>
<td>213</td>
<td>68.6</td>
<td>31.4</td>
<td>3832</td>
</tr>
<tr>
<td></td>
<td>1997</td>
<td>222</td>
<td>70.3</td>
<td>29.7</td>
<td>4004</td>
</tr>
<tr>
<td></td>
<td>1998</td>
<td>226</td>
<td>70.7</td>
<td>29.3</td>
<td>4463</td>
</tr>
<tr>
<td></td>
<td>1999</td>
<td>243</td>
<td>72.2</td>
<td>27.8</td>
<td>4735</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>256</td>
<td>74.2</td>
<td>25.8</td>
<td>5282</td>
</tr>
</tbody>
</table>

**COMPUTER STUDIES SAS**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Year of Exit</th>
<th>Schools</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Strand</td>
<td>1998</td>
<td>70</td>
<td>50.0</td>
<td>50.0</td>
<td>1077</td>
</tr>
<tr>
<td></td>
<td>1999</td>
<td>75</td>
<td>51.2</td>
<td>48.8</td>
<td>1450</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>87</td>
<td>54.0</td>
<td>46.0</td>
<td>1673</td>
</tr>
<tr>
<td>General Strand</td>
<td>1998</td>
<td>103</td>
<td>52.8</td>
<td>47.2</td>
<td>2130</td>
</tr>
<tr>
<td></td>
<td>1999</td>
<td>167</td>
<td>53.6</td>
<td>46.4</td>
<td>3204</td>
</tr>
<tr>
<td></td>
<td>2000</td>
<td>166</td>
<td>57.8</td>
<td>42.2</td>
<td>3783</td>
</tr>
</tbody>
</table>

**IPT LEVEL OF ACHIEVEMENT DATA FOR TWO YEARS.**

(VHA highest achievement - VL least achievement)

<table>
<thead>
<tr>
<th>Year</th>
<th>Gender</th>
<th>VHA</th>
<th>HA</th>
<th>SA</th>
<th>LA</th>
<th>VLA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>F</td>
<td>13.17%</td>
<td>21.04%</td>
<td>41.20%</td>
<td>19.01%</td>
<td>5.57%</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>12.07%</td>
<td>16.82%</td>
<td>38.76%</td>
<td>22.97%</td>
<td>9.38%</td>
</tr>
<tr>
<td>1999</td>
<td>F</td>
<td>17.13%</td>
<td>22.21%</td>
<td>39.27%</td>
<td>16.15%</td>
<td>5.23%</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>11.85%</td>
<td>15.71%</td>
<td>37.73%</td>
<td>24.74%</td>
<td>9.97%</td>
</tr>
</tbody>
</table>
programs are quite distinguishable from those in other states because of the emphasis on Object Role Modelling in the design and implementation process. The level of student projects in this area is exceptional and levelled by some, as at least first-year university standard. The syllabus also emphasises applications of Polya’s problem solving algorithmic method. Students are expected to complete at least one major project involving all steps of the software development cycle. Tools such as Access and Visual Basic or Delphi are commonly used to achieve this though some schools continue to use Pascal. Specific topics on computer systems, artificial intelligence and Social and Ethical Implications are also included in the syllabus. Throughout any course of study, schools are expected to use social and ethical implications and communications as binding themes which generate a holistic interpretation of subject matter.

It is planned to publish Subject Support Materials for this subject in early 2001. Schools will be advised when these become available and they may be available through the Board web site.

Information Technology Systems (ITS)

ITS is a Board subject. It contributes to tertiary entrance, and can provide students with a vocational Certificate III in Information Technology. There are no prerequisites to the study of this subject apart from successful completion of Year 10. It is the first IT Studies subject in the country to provide this level of national accreditation.

ITS allows students to focus on the study of software applications, networks or a combination of these two areas. It approaches the areas of study through problem solving and project management structures, and emphasises the importance of being able to work individually or in teams, to communicate effectively, and to develop productive relationships with clients. ITS is compatible with IPT. It complements that subject by focusing on areas of information technology studies not covered to any significant degree in IPT. Some schools have students studying both subjects.

The course is structured so that students study a common core for about one half of the course, then specialise in studies that lead to one of the certificates. There are two electives, 'Create web pages with multimedia' and 'Build an Internet infrastructure'. These are designed to be studied for about one semester. Students can choose to study zero, one or two of these. By structuring the course in this way, students can delay specialisation until late in the course if necessary. This allows schools to deliver different certificates to different students, all in the same class, if necessary.

In 2000, ITS is being trialed in 15 schools with 331 students. An independent course evaluator has been appointed, and an interim evaluation report will be presented to the Board in August this year.

Computer Studies (CS)

Computer Studies is a Board-registered subject. It does not contribute to tertiary entrance but can provide students with a Certificate I or II in Information Technology. There are no prerequisites to the study of this subject apart from successful completion of Year 10.

Computer Studies has a core and open unit structure that allows schools flexibility in the choice of material for delivery to students. The core comprises three units:

- The computer as a publishing tool
- The computer as a data management tool
- The computer as a problem solving tool

Schools, or students, then choose five of the following open units to complete the course.

- Computers in the workplace
- Computers in the IT industry
- Documents
- Using the Internet
- Multimedia presentations
- Multimedia components
- Network fundamentals
- Expert systems and robotics
- Integrated project
- School based unit

Each core or open unit is designed to be studied for about one school term (half of one semester). By choosing open units carefully, it is possible to offer courses that focus on a particular area. For example, some schools choose to take a multimedia approach by offering the three core units all from a multimedia perspective, then a selection of five from the documents, internet, two multimedia, integrated project and school based open units.

The diagram on the following page provides a graphical outline of the course.

An assessment starter package for the SAS can be downloaded from the QBSSSSS website. The URL is listed at the end of this article.

Years 8 - 10

There is a great deal of diversity in IT studies in Years 8 - 10 in Queensland. This ranges from nothing, to schools offering Certificate II vocational qualifications to high quality IT courses. The diversity has arisen because there has never been a junior school syllabus in IT studies, although a syllabus in Information and Communication Education (ICE) is being developed by the Queensland School Curriculum Council which now has responsibility for P-10 curriculum...
**Computer Studies—Strand A (Information technology at work)**

**Study area core**
- Core unit 1: The computer as a publishing tool
- Core unit 2: The computer as a data-management tool
- Core unit 3: The computer as a problem-solving tool

**5 open units**
- Computers in the workplace
  - ICAITW01B Work effectively in an information technology environment
  - ICAITW002B Communicate in the workplace
  - ICAITU007B Maintain equipment and consumables
  - ICAITU004B Apply occupational health and safety procedures
  - ICAIT014B Connect hardware peripherals
  - ICAIT015B Install software applications

**Certificate I in Information Technology**

**Certificate II in Information Technology**

**Exit level of achievement**

**Computer Studies—Strand B (Practical computing)**

**Study area core**
- Core unit 1: The computer as a publishing tool
- Core unit 2: The computer as a data-management tool
- Core unit 3: The computer as a problem-solving tool

**5 open units**
- Computers in the workplace
- Working in an IT environment
- Documents
- Using the Internet
- Multimedia presentations
- Developing multimedia components
- Network fundamentals
- Expert systems and robotics
- Integrated Project
- School-Based Unit

**Exit level of achievement**
development. QSITE has involvement in the syllabus development process and advocates a course that teaches students to solve information problems rather than focus on narrow skills development using application programs. In this way, such a course could introduce concepts and approaches that are developed in the senior school subjects and thus provide students with insights into what the senior subjects are all about.

**ASSESSMENT PRACTICES**

The Queensland Board of Senior Secondary School Studies operates a system of moderated, school-based assessment. The moderation system provides comparability and forms the basis for valid and reliable assessment in senior secondary schools. It involves teachers in schools and on Board panels reaching consensus through consultation and negotiation. Schools write subject work programs based on approved syllabuses, and submit the work programs to review panels for accreditation. Teachers provide learning and assessment experiences for students as outlined in the accredited work program, and prepare submissions of folios of students’ work for monitoring and verification by teachers on review panels who advise schools about the quality of the decisions on standards of student work.

Assessment in Queensland senior schools is criteria and standards based. One on-going exercise in assessment is the drafting of criteria and standards schemas that are structured using descriptive standards. For example, a criteria and standards schema for assessing the object role modeling process is attached. This seeks to identify ‘point-at-able’ features of this process that can be identified in student work.

The use of schemas such as this provides valuable feed-forward information to students prior to attempting the assessment tasks, and a mechanism for feedback from the teacher on completion of the task. The schemas identify the syllabus criteria and corresponding features of the student work that the school is assessing. They provide indications to review panels of the assessment standards that the school has identified as being its interpretation of the syllabus expectations.

**PROFESSIONAL DEVELOPMENT OPPORTUNITIES**

Professional development is, strictly, the responsibility of employing authorities in this state. Because of this, the Board provides activities that are mainly restricted to developments in the assessment area. QSITE provides forums for professional interaction and conducts professional development for teachers of IT studies formally through workshops and its annual conference and, informally, through hosting on-line communities. Its web site is located at www.qsite.edu.au. However, professional development for all IT studies teachers need some review and perhaps some partnerships are necessary to help Queensland maintain a supply of teachers for its increasing enrolments and to enable existing teachers to maintain knowledge and skills.

**ISSUES ABOUT IT STUDIES IN THE STATE**

Some of the issues for teachers of IT studies and the development of IT studies curriculum in Queensland include:

- Development and accreditation of work programs written to the 1998 syllabus in IPT by November 2000;
- Monitoring the trial of ITS with consideration of involvement in a pilot syllabus in the next few years;
- Helping teachers become accredited to teach the Computer Studies SAS;
- Development of descriptive standards schemas for assessment purposes;
- Contributing to, and eventually planning and implementing the proposed P-10 syllabus in Information and Communication Education currently being developed by the Queensland School Curriculum Council;
- Developing strong networks for IT teachers to share resources and build alliances;
- Lack of professional development opportunities;
- Shortage of IT Studies teachers.

**CONTACT INFORMATION IN THE STATE**

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**REFERENCES**


### A Criteria and Standards Schema for Assessing Object Role Modelling

<table>
<thead>
<tr>
<th>Criteria</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Elementary facts</strong></td>
<td>Consistently identifies entity types, reference schemes, values and roles</td>
<td>Consistently identifies entity types, reference schemes, values and roles</td>
<td>Identifies entity types, reference schemes, values</td>
<td>Identifies entity types</td>
</tr>
<tr>
<td><strong>Elementary facts</strong></td>
<td>Consistently identifies entity types, reference schemes, values and roles</td>
<td>Consistently identifies entity types, reference schemes, values and roles</td>
<td>Consistently identifies entity types, reference schemes, values</td>
<td>Identifies entity types</td>
</tr>
<tr>
<td><strong>Conceptual Schema</strong></td>
<td>Consistently correctly identifies entity types, reference schemes, values and roles</td>
<td>Consistently correctly identifies entity types, reference schemes, values and roles</td>
<td>Identifies entity types, reference schemes, values</td>
<td>Identifies entity types</td>
</tr>
<tr>
<td><strong>Uniqueness constraints</strong></td>
<td>Generally correctly identifies entity types</td>
<td>Generally correctly identifies entity types</td>
<td>Little or no identification of uniqueness constraints</td>
<td>Little or no identification of uniqueness constraints</td>
</tr>
<tr>
<td><strong>Cardinality roles</strong></td>
<td>Generally correctly identifies entity types</td>
<td>Generally correctly identifies entity types</td>
<td>Little or no identification of uniqueness constraints</td>
<td>Little or no identification of uniqueness constraints</td>
</tr>
<tr>
<td><strong>Other constraints</strong></td>
<td>Generally correctly identifies entity types</td>
<td>Generally correctly identifies entity types</td>
<td>Little or no identification of uniqueness constraints</td>
<td>Little or no identification of uniqueness constraints</td>
</tr>
<tr>
<td><strong>Entity checks</strong></td>
<td>Satisfies the criteria</td>
<td>Satisfies the criteria</td>
<td>Satisfies the criteria</td>
<td>Satisfies the criteria</td>
</tr>
<tr>
<td><strong>Overall standard</strong></td>
<td>Satisfies the criteria</td>
<td>Satisfies the criteria</td>
<td>Satisfies the criteria</td>
<td>Satisfies the criteria</td>
</tr>
</tbody>
</table>