Information technology in a global society

Diploma Programme

Guide

IBO

Information technology in a global society

Guide

For first examinations at HL in 2007

For first examinations at SL in 2007

Information technology in a global society—guide

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IBO mission statement

The International Baccalaureate Organization aims to develop inquiring, knowledgeable and caring young people who help to create a better and more peaceful world through intercultural understanding and respect.

To this end the IBO works with schools, governments and international organizations to develop challenging programmes of international education and rigorous assessment.

These programmes encourage students across the world to become active, compassionate and lifelong learners who understand that other people, with their differences, can also be right.

IB learner profile

The aim of all IB programmes is to develop internationally minded people who, recognizing their common humanity and shared guardianship of the planet, help to create a better and more peaceful world.

IB learners strive to be:

Inquirers
They develop their natural curiosity. They acquire the skills necessary to conduct inquiry and research and show independence in learning. They actively enjoy learning and this love of learning will be sustained throughout their lives.

Knowledgeable
They explore concepts, ideas and issues that have local and global significance. In so doing, they acquire in-depth knowledge and develop understanding across a broad and balanced range of disciplines.

Thinkers
They exercise initiative in applying thinking skills critically and creatively to recognize and approach complex problems, and make reasoned, ethical decisions.

Communicators
They understand and express ideas and information confidently and creatively in more than one language and in a variety of modes of communication. They work effectively and willingly in collaboration with others.

Principled
They act with integrity and honesty, with a strong sense of fairness, justice and respect for the dignity of the individual, groups and communities. They take responsibility for their own actions and the consequences that accompany them.

Open-minded
They understand and appreciate their own cultures and personal histories, and are open to the perspectives, values and traditions of other individuals and communities. They are accustomed to seeking and evaluating a range of points of view, and are willing to grow from the experience.

Caring
They show empathy, compassion and respect towards the needs and feelings of others. They have a personal commitment to service, and act to make a positive difference to the lives of others and to the environment.

Risk-takers
They approach unfamiliar situations and uncertainty with courage and forethought, and have the independence of spirit to explore new roles, ideas and strategies. They are brave and articulate in defending their beliefs.

Balanced
They understand the importance of intellectual, physical and emotional balance to achieve personal well-being for themselves and others.

Reflective
They give thoughtful consideration to their own learning and experience. They are able to assess and understand their strengths and limitations in order to support their learning and personal development.

The International Baccalaureate Diploma Programme is a rigorous pre-university course of studies, leading to examinations, that meets the needs of highly motivated secondary school students between the ages of 16 and 19 years. Designed as a comprehensive two-year curriculum that allows its graduates to fulfill requirements of various national education systems, the Diploma Programme model is based on the pattern of no single country but incorporates the best elements of many. The Diploma Programme is available in English, French and Spanish.

The programme model is displayed in the shape of a hexagon with six academic areas surrounding the core. Subjects are studied concurrently and students are exposed to the two great traditions of learning: the humanities and the sciences.

Diploma Programme students are required to select one subject from each of the six subject groups. At least three and not more than four are taken at higher level (HL), the others at standard level (SL). HL courses represent 240 teaching hours; SL courses cover 150 hours. By arranging work in this fashion, students are able to explore some subjects in depth and some more broadly over the two-year period; this is a deliberate compromise between the early specialization preferred in some national systems and the breadth found in others.

Distribution requirements ensure that the science-orientated student is challenged to learn a foreign language and that the natural linguist becomes familiar with science laboratory procedures. While overall balance is maintained, flexibility in choosing HL concentrations allows the student to pursue areas of personal interest and to meet special requirements for university entrance.

Successful Diploma Programme students meet three requirements in addition to the six subjects. The interdisciplinary theory of knowledge (TOK) course is designed to develop a coherent approach to learning that transcends and unifies the academic areas and encourages appreciation of other cultural perspectives. The extended essay of some 4,000 words offers the opportunity to investigate a topic of special interest and acquaints students with the independent research and writing skills expected at university. Participation in the creativity, action, service (CAS) requirement encourages students to be involved in creative pursuits, physical activities and service projects in the local, national and international contexts.

For first examinations at HL in 2007

For first examinations at SL in 2007

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The Diploma Programme information technology in a global society (ITGS) course is the study and evaluation of the impact of information technology (IT) on individuals and society. It explores the advantages and disadvantages of the use of digitized information at the local and global level. ITGS provides a framework for the student to make informed judgments and decisions about the use of IT within social contexts.

Although ITGS shares methods of critical investigation and analysis with other social sciences, it also considers ethical questions found in the study of philosophy. Students come into contact with IT on a daily basis because it is so pervasive in the world in which we live. This widespread use of IT inevitably raises important questions about social and ethical issues that shape our society today. ITGS offers an opportunity for a systematic study of these issues, whose range is such that they fall outside the scope of any other single discipline.

The nature of the subject is defined by the use of fundamental ITGS terms. For the purpose of the ITGS syllabus the following definitions apply.

Information technology is the acquisition, processing, storage, manipulation and dissemination of digital information by computing or telecommunications or a combination of both.

Social impact includes the economic, political, cultural, legal, environmental, ergonomic, health and psychological effects of IT on human life.

Ethical considerations refer to the responsibility and accountability of those involved in the design, implementation and use of IT.

An information system is a collection of people, information technologies, data, methods and policies organized to accomplish specific functions and solve specific problems.

The aims of all subjects in **group 3, individuals and societies** are to:

1. encourage the systematic and critical study of: human experience and behaviour; physical, political, economic and social environments; the history and development of social and cultural institutions

2. develop in the student the capacity to identify, to analyse critically and to evaluate theories, concepts and arguments about the nature and activities of the individual and society

3. enable the student to collect, describe, analyse and interpret complex data and source material and to test hypotheses

4. develop an awareness in the student that human attitudes and beliefs are widely diverse and that the study of society requires an appreciation of such diversity

5. enable the student to recognize that the knowledge and methodologies of the subjects in group 3 are contestable and that their study requires the acceptance of uncertainty.

The aims of the **information technology in a global society** (ITGS) course at HL and SL are to:

1. develop an understanding of the advantages and disadvantages of new technologies as methods of expanding our knowledge of the world at the local and global level

2. promote an understanding of the social significance of information technology for individuals, communities and organizations

3. analyse and evaluate the ethical considerations arising from the widespread use of information technology at the local and global level

4. recognize that people can hold diverse opinions about the impact of information technology on individuals and societies.

There are five assessment objectives for the ITGS course at SL and eight at HL.

Having followed the ITGS course at SL or HL, students will be expected to:

1. understand and critically examine the global impact of IT developments

2. demonstrate a knowledge and understanding of the social and ethical implications of IT systems and developments at the local, national and global level

3. analyse and evaluate the social and ethical implications of IT developments

4. express ideas clearly and coherently with supporting arguments and examples.

In addition to the above, students following the course at SL will be expected to be able to:

5. design and apply IT solutions to a problem set in a social context through a project.

In addition to objectives 1 to 4 above, students following the course at HL will be expected to be able to:

6. analyse and evaluate relevant examples of the global impact of IT in a portfolio of individually researched studies

7. demonstrate an ability to synthesize[1] and reflect on ideas

8. demonstrate an ability to project[2] the global impact of IT developments

9. research, analyse and evaluate[3] relevant material and examples including "real-life" global or local interactions.

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1 combine ideas to establish new relationships/perspectives, thus creating a new whole.

2 generate new ideas based on evidence.

3 make an appraisal of the argument or concept under investigation or discussion. Students should weigh the nature of the evidence available, and identify and discuss the convincing aspects of the argument, as well as its limitations and implications.

Higher level and standard level

The ITGS syllabus at HL and SL is divided into three sections: social and ethical issues, IT systems in a social context and the six areas of impact.

Section 1: social and ethical issues

1.1   Reliability

1.2   Integrity

1.3   Security

1.4   Privacy and anonymity

1.5   Authenticity

1.6   Intellectual property

1.7   Equality of access

1.8   Control

1.9   Globalization and cultural diversity

1.10   Policies and standards

1.11   People and machines

Section 2: IT systems in a social context

2.1   Basics: hardware and networks

    2.1.1   Systems fundamentals

    2.1.2   Networks

2.2   Applications

    2.2.1   Software fundamentals

    2.2.2   Databases and spreadsheets

    2.2.3   Word processing and desktop publishing

    2.2.4   Images, sound and presentations

2.2.5   Modelling and simulations

2.2.6   Tutorials, training and wizards (assistants)

2.3   Communication systems

2.3.1   The Internet

2.3.2   Personal and public communications

2.4   Integrated systems

2.4.1   Robotics

2.4.2   Artificial intelligence and expert systems

Section 3: areas of impact

Students at HL are required to study all **six** areas of impact. Students at SL are required to study part A and a minimum of **two** other areas of impact chosen from part B.

Part A

3.1   Business and employment

Part B

3.2   Education

3.3   Health

3.4   Arts, entertainment and leisure

3.5   Science and the environment

3.6   Politics and government

Teaching ITGS—an integrated approach

The notes that follow show how the three different sections of the syllabus are interconnected. They suggest how teachers can take an integrated approach when they teach the syllabus, using any of the three sections as a starting point. The diagram below illustrates this integrated approach.
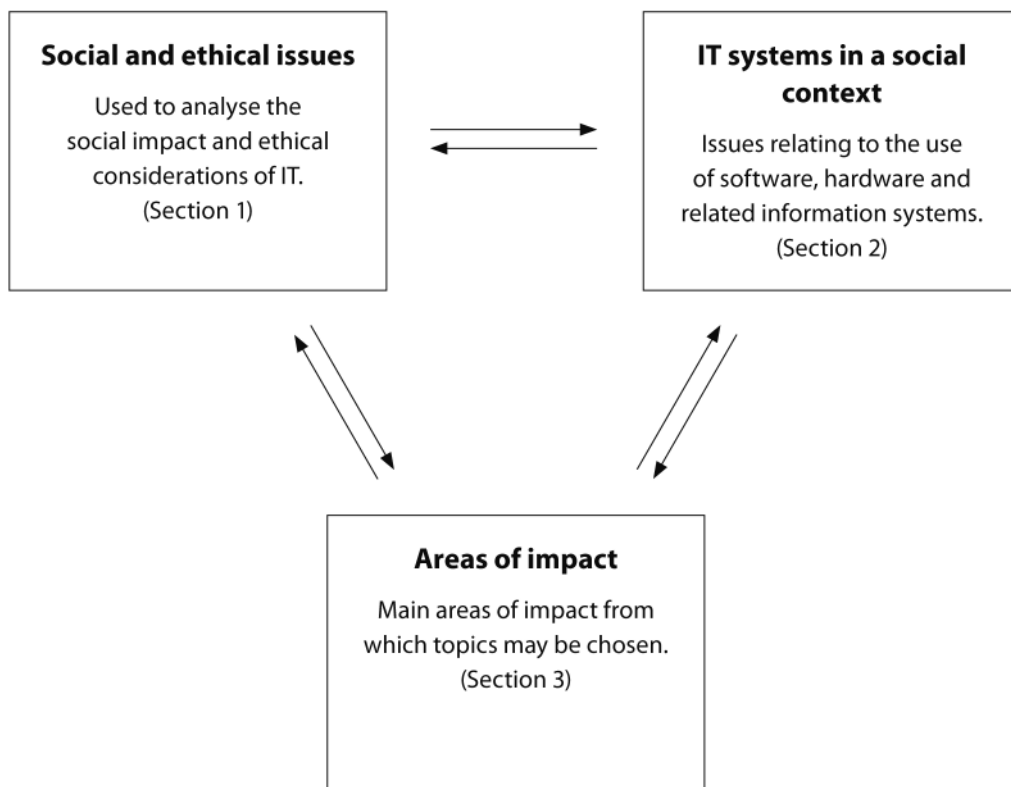
Approaches to the teaching of ITGS

Whatever the structure of the course of study devised by the teacher, it must take into account the concepts included in all three sections.

- The sections are not designed to be presented or studied in isolation.

- The sections are not designed to be studied in any particular order. Teachers should adopt an integrated approach to the subject.

- The constituent parts form a whole.

Teaching and learning activities should weave the parts of the syllabus together and focus on their interrelationships so that, by the end of the course, students are able to appreciate the links between all the different parts of the syllabus. The way in which the sections may be approached is flexible and any starting point is acceptable. The three examples given here show how a topic from one of the sections can be a starting point that leads into the other two sections. Whichever approach is chosen, the use of real-life situations based on current events is recommended as a stimulus for discussion.

It is essential that examples are drawn from the local, national and global level.

Methodologies for analysing social impact and ethical considerations

Throughout the course students must analyse and evaluate the social impact of information technology on individuals and society and consider the ethical issues raised by this impact.

Social impact and ethical considerations need to be analysed from both **local** and **global** perspectives, recognizing that attitudes and opinions are diverse within and between different cultures.

Key questions

Social issues

The analysis of **social issues** can be guided by answering the following key questions.

1. What are the social issues associated with a particular IT development?

2. How did the IT development emerge?

3. Who are the stakeholders—individuals, institutions, societies who initiate and control the IT developments and are affected by them?

4. What are the advantages and disadvantages for the stakeholders?

5. What feasible solutions can be applied to overcome problems?

6. What is the social impact of the IT development on human life? This may include some or all of the following areas: economic, political, cultural, legal, environmental, ergonomic, health and psychological.

7. What are the social impacts on local and global communities?

Ethical issues

The analysis of **ethical issues** can be guided by answering the following key questions.

1. What are the ethical issues associated with a particular IT development?

2. Who is responsible?

3. Who is accountable?

4. What policies, rules or laws apply to the situation?

5. What are the alternative ethical decisions?

6. What are the consequences of these decisions?

Section 1: social and ethical issues

The widespread use of IT raises questions about social and ethical issues that shape the world today. Students should become familiar with all the social and ethical issues described in this section. Teachers should introduce the social and ethical issues as appropriate using the integrated approach illustrated in the diagram at the beginning of the syllabus details. In this way students can examine social and ethical issues that are raised when IT systems are used in a range of areas. The use of IT is likely to bring both advantages and disadvantages, both costs and benefits, and students should study the impact of IT in a critical way. It is important that examples are drawn from the local, national and global level.

1.1 Reliability

Reliability refers to the operation of hardware, the design of software, the accuracy of data or the correspondence of data with the real world. Data may be unreliable if it is entered incorrectly or if it becomes outdated. For example, a medical record that becomes dissociated from the patient it refers to becomes unreliable. The reliability of machines, software and data determines our confidence in their value.

1.2 Integrity

Integrity refers to correspondence of data with itself, at its creation. Data lacks integrity when it has been changed accidentally or tampered with. For example, a hacker might change driver licence data resulting in arrests of innocent people.

1.3 Security

Security refers to the protection of hardware, software, machines and networks from unauthorized access, alteration or destruction. Security measures include restricted access to machines and networks and encryption of information. The degree of security of information systems determines society's confidence in the information contained in the systems.

1.4 Privacy and anonymity

Privacy is the ability of individuals and groups to determine for themselves when, how and to what extent information about themselves is shared with others. At its extreme, privacy becomes anonymity, which might be called for in some contexts but is dangerous in others. For example, discussion of a delicate subject might require anonymity, or at least privacy. On the other hand, anonymity could also conceal the perpetrators of criminal, terrorist or computer hacking acts.

1.5 Authenticity

Authenticity means establishing the user's identity beyond reasonable doubt. Authenticating the user is crucial in many situations, particularly in business and legal matters. A simple example of authentication is user login onto a network. A more advanced example would be the use of encrypted digital signatures in a business transaction.

1.6 Intellectual property

Intellectual property includes ideas, discoveries, writings, works of art, software, collections and presentations of data. Copyrights, trademarks and patents legally protect intellectual property, but easy and accurate duplication methods made available by IT can undermine such protections. On the other hand, the same methods create opportunity for inexpensive dissemination of information.

1.7   Equality of access

IT has the potential to offer universal access to information, regardless of distance, age, race, gender or other personal characteristics. However, the above characteristics, and cost, can also bar individuals or groups from access. For example, while telelearning brings previously unavailable opportunities to everyone's doorstep, the cost of hardware, software or course fees might place the learning beyond the reach of an average person.

1.8   Control

As an instrument of control, IT improves reliability, accuracy and speed of systems. However, it can also be used to control people. An automatic aircraft landing system provides an example of increased reliability resulting from IT control. Employer surveillance of employees represents a new kind of control imposed on people.

1.9   Globalization and cultural diversity

Globalization means the diminishing importance of geographic, political, economic and cultural boundaries. IT has played a major role in reducing these boundaries. For example, any dramatic event anywhere in the world can be broadcast almost instantly by television or on the Internet. However, there is a fear that easier communication can become a source of cultural homogeneity. The new global village provides a worldwide cultural awareness, but may lead to less diversity.

1.10   Policies and standards

Policies are enforceable measures intended to promote appropriate use. They can be developed by governments, businesses, and private groups or individuals. They normally consist of rules governing access to, or use of, information, hardware and software. For example, a national policy on IT security would need to define what constitutes unlawful access to networks and how to treat transgression. Policies also affect the exchange of information, for example, by making it subject to copyright laws. In general, policies can promote or restrict access, modify behaviour or require the fulfillment of certain conditions prior to or during use.

Standards are social or technical rules and conventions that enable compatibility and therefore facilitate communication or interoperability between different IT systems and their components. They might govern the design and use of hardware, software and information. For example, communication protocols used on the Internet, the ASCII representation for characters, or the design of the printer port on a personal computer are all governed by standards.

1.11   People and machines

The interaction of humans with IT hardware raises all the issues encountered in this section, as well as additional ones such as the following.

- Who controls the design of technology and the pace of its introduction?

- How safe and effective is the design?

- Is technology going to extend human faculties and make work easier and more pleasant, or are machines going to displace humans and lead to mass unemployment?

- Is technology used appropriately, or should a better, possibly non-technological alternative be found?

- Which areas of human endeavour are best served by IT systems?

- Which social and ethical issues arise from a comparison of people and machines in the following areas: stamina, memory, accuracy, speed, analysis, synthesis, judgment, innovation, creativity?

Section 2: IT systems in a social context

In this section neither the social and ethical issues nor the technological concepts listed under knowledge of technology are exhaustive nor is the study of all of them compulsory. They are given as examples only.

Teachers should make a judgment on the level of detail and depth of study that is required to enable students to understand the social and ethical issues that arise in the areas of impact because of the use of information technology.

New technological developments during the lifetime of this syllabus will raise new social and ethical issues that will affect the areas of impact. Teachers should introduce these technological developments and related issues into the course as appropriate, using the integrated approach illustrated in the diagram at the beginning of the syllabus details.

2.1   Basics: hardware and networks

2.1.1   Systems fundamentals

Social and ethical issues

Students must study and evaluate the social and ethical issues involved in the use of IT systems. These may include:

- the economic value of information

- environmental issues related to the production of computer components and supplies

- environmental issues related to the disposal of obsolete hardware and computer supplies

- health issues and ergonomics related to the use of hardware

- password protection, security, biometrics and authorized access

- issues related to viruses on both stand-alone and network systems

- greater dependence of organizations on IT

- increase in teleworking and the virtual office

- the need for ongoing training and retraining

- the economic and psychological implications of planned IT obsolescence in hardware, software and services, which has been forced on consumers by the IT industry

- organizational policies and standards, for example, e-mail, surveillance and monitoring policies.

Knowledge of technology

In order to study and evaluate the social and ethical issues involved in the use of IT systems, the student must have an understanding of related technological concepts. These may include:

- key terms—data, information, hardware components, for example, input devices, output devices, processing, storage, memory (RAM, ROM), MHz, dpi, bit, KB, MB, GB, TB, ASCII, compatibility, OCR, OMR, bar code, baud, verification and validation, encryption/decryption, firewall, virus, Trojan horse, worm, logic bomb, platform, peripheral

- use, advantages and disadvantages of analogue and digital data

- operating systems (multitasking, boot) and utilities, for example, defragment, disk format, virus scan programs

- responsible computer use (for example, regular back-ups, virus checking, security, storage, housekeeping)

- a responsible and systematic approach to implementing or upgrading IT systems, for example, analysis, design, implementation, testing, evaluation, training, policies and standards.

2.1.2   Networks

Social and ethical issues

Students must study and evaluate the social and ethical issues involved in the use of networks. These may include:

- vulnerability of networks to intrusion

- ability to implement different levels of access

- implications of network failure, for example, banks, transportation, hospitals, schools

- implications of collaboration, groupware and data sharing

- threat of compromising data integrity in shared databases

- additional threats to privacy on a network compared with stand-alone computers

- the need to authenticate information

- intellectual property protection on networks, for example, site licences, file access

- equality of access for different groups and individuals

- ability to monitor users (surveillance); concerns of people regarding monitoring

- ability to filter incoming data

- ability to control personal, business, military, government operations over a wide geographical area

- increased globalization, for example, EFT, EDI, e-commerce

- need for interface standards

- need for network use policy.

Knowledge of technology

In order to study and evaluate the social and ethical issues involved in the use of networks the student must have an understanding of related technological concepts. These may include:

*   key terms—LAN, WAN, client, server, Ethernet, access, access permissions, login, password, firewall, sysadmin, UPS, EDI

*   types of intrusion, for example, viruses, hacking, phreaking

*   security measures

*   network types, for example, Intranet, Internet, VPN

*   encryption and SSL

*   e-commerce.

2.2   Applications

2.2.1   Software fundamentals

Social and ethical issues

Students must study and evaluate the social and ethical issues involved in the use of software. These may include:

*   bug-free software

*   software piracy

*   interfaces adapted for the disabled

*   language independence of GUIs, making computers accessible to a very wide range of users, including those with special needs, and very small children

*   use of password protection to prevent unauthorized access

*   globalization of software.

Knowledge of technology

In order to study and evaluate the social and ethical issues involved in the use of software, the student must have an understanding of related technological concepts. These may include:

*   key terms—software (application), shareware, public domain, freeware, commercial software, integrated software, user manual, registration card, serial number, warranty, copyright, licence (multi-user, single user, site licence), compression/decompression, back-up, back door (trapdoor), upload/download, wizard, template

*   GUI, command-line interface, voice recognition.

2.2.2   Databases and spreadsheets

Social and ethical issues

Students must study and evaluate the social and ethical issues involved in the use of databases and spreadsheets. These may include:

*   privacy of information in different cultures

*   rights of individuals with respect to the storage of personal data

*   social consequences of outdated or incorrect data stored in databases

- social consequences of the release of sensitive data stored in databases

- legislation on access and use of database information in different countries

- responsibility for the security of data stored in databases from different perspectives, for example, the developer, the user and the management of an organization

- accountability for the negative social effects caused by insecure databases

- ethical issues related to the collection and use of personal data

- ethical issues related to the selling of data stored in databases.

Knowledge of technology

In order to study and evaluate the social and ethical issues involved in the use of **databases**, the student must have an understanding of related technological concepts. These may include the following.

Design and creation concepts

- Key terms—field, key field, record, search, query, sort, database management system, mail merge

- Flat-file database versus relational database

- Paper files versus electronic files

- Data redundancy and data integrity

- Updating data

Storage and access concepts

- Data transfer between a database and a spreadsheet

- Search and the use of the Boolean operators (AND, OR and NOT)

- Data mining/data matching

Presentation concepts

- Report generation

- Special-purpose databases, for example, personal information managers, encyclopedias, library systems

In order to study and evaluate the social and ethical issues involved in the use of **spreadsheets**, the student must have an understanding of related technological concepts. These may include the following.

Design and creation concepts

- Key terms—cell, cell format (number, text, value, function, calculation, date, currency), row, column, label, macro, replicate, template, worksheet, "what if" questions, range, absolute and relative reference

- Paper files versus electronic files

- Reliability and integrity of data

Storage and access concepts

- Data transfer between a database and a spreadsheet

Presentation concepts

- Select, print and display area of a worksheet

- Use of the appropriate graph or chart for the meaningful representation of information

- Special-purpose spreadsheets, for example, inventory, budget

2.2.3 Word processing and desktop publishing

Social and ethical issues

Students must study and evaluate the social and ethical issues involved in the use of word processing and desktop publishing (DTP). These may include:

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- global access to information available on CD-ROMs versus Internet

- use of virtual actors in films

- biased information

- reliability of data

- social and ethical issues related to games.

Knowledge of technology

In order to study and evaluate the social and ethical issues involved in the use of images, sound and presentations, the student must have an understanding of related technological concepts. These may include the following.

Design and creation concepts

- Key terms—animation, bit-map versus vector graphics, object-oriented, clip art, CAD, hypermedia, hypertext, pixel, resolution, MP3, MIDI, morph

- Data integrity

- Consistency in design elements

- Use of appropriate fonts, sound, images, video to convey a specific message

Storage, processing and access concepts

- File formats, for example, storage requirements, loading time, portability

- Sound, image and video capture and editing

- Updating and combining sounds or images at a later point in time to create a new work of art

2.2.5 Modelling and simulations

Social and ethical issues

Students must study and evaluate the social and ethical issues involved in the use of modelling and simulations. These may include:

- reliability of predictions based on computer models, for example, weather, global warming

- economic effects of the use of models to design and test new products

- security issues involved in military simulations

- social impact of reliance on simulations to examine issues of public policy

- responsibility of the designer for accuracy of assumptions underlying the model

- ethical considerations involved in deciding when to use models or simulations to ensure human safety.

Knowledge of technology

In order to study and evaluate the social and ethical issues involved in the use of modelling and simulations, the student must have an understanding of related technological concepts. These may include:

- key terms—model, simulation, feedback loop

- faulty or hidden assumptions

- extent and effect of the simplification of reality

- extent to which the phenomenon being modelled is understood

- processing power needed to create complex models

- visualization of information

- correspondence of the model with reality.

2.2.6   Tutorials, training and wizards (assistants)

Social and ethical issues

Students must study and evaluate the social and ethical issues involved in the use of tutorials, training and wizards. These may include:

- the balance in responsibility between an individual and an organization for training

- the need for IT companies to consider global and cultural diversity when preparing training and tutorial software

- the requirement of organizations to provide training when implementing change.

Knowledge of technology

In order to study and evaluate the social and ethical issues involved in the use of tutorials, training and wizards, the student must have an understanding of related technological concepts. These may include:

- key terms—tutorial software, training software, wizards and assistants, help menu and help features, "Read Me" files

- using wizards, assistants and online assistants in the design and creation of a product, for example, desktop-published documents, slideshows, web sites.

2.3   Communication systems

2.3.1   The Internet

Social and ethical issues

Students must study and evaluate the social and ethical issues involved in the use of the Internet. These may include:

- reliability and authenticity of information

- social consequences of addiction to the Internet

- social impact of global viruses

- social impact of dependence on the Internet

- etiquette rules for appropriate behaviour when using the Internet

- social impact of the domination of English as the main web language

- social impact of theft of identity through the Internet

- social impact of open access to unsuitable material on the Internet

- ethical issues related to misuse of the Internet, for example, spamming

- ethical considerations of IT-rich versus IT-poor nations as a result of differing access

- ethical considerations relating to the use of encryption

- ethical considerations relating to workplace monitoring.

Knowledge of technology

In order to study and evaluate the social and ethical issues involved in the use of the Internet, the student must have an understanding of related technological concepts. These may include:

- key terms—Internet protocols, for example, HTTP, FTP, TCP/IP, cookies, listserv, web cam, Internet languages, netiquette, Intranet, URL, hyperlink, bandwidth, WWW, browser, search engine, e-mail

- means for blocking access to information

- features of a web browser

- comparison of Internet and Intranet

- encryption methods

- the limiting effect of bandwidth

- e-mail

- viruses

- features of a web page

- global databases

- online services, e-commerce, banking, health, libraries

- use of appropriate search engines.

2.3.2   Personal and public communications

Social and ethical issues

Students must study and evaluate the social and ethical issues involved in the use of personal and public communications. These may include:

- the psychological consequences of people being in permanent contact

- ethical considerations of control as the result of using communications technologies

- social impact on health of the use of mobile devices

- effect on personal productivity of personal communications devices

- effect on the environment of personal communications devices

- social effects of telecommuting

- social effects of the widespread use of teleconferencing and videoconferencing

- social and environmental impact and ethical considerations of telecommuting

- social impact and ethical considerations of: distance learning, digital entertainment, global media and public information systems.

Knowledge of technology

In order to study and evaluate the social and ethical issues involved in the use of personal and public communications, the student must have an understanding of related technological concepts. These may include:

- key terms—convergence, teleconferencing, videoconferencing, telecommuting, digital television, push–pull technologies

- mobile phone and associated services and uses

- digital entertainment versus live entertainment

- contents of digital entertainment, for example, violence, pornography and realism

- features of telecommuting, for example, environmental aspects, flexibility, productivity, business and social relationships

- face-to-face communications versus communications via technology

- minimum requirements to enable realistic teleconferencing and videoconferencing

- undetected intrusions into IT systems, for example, phone tapping

- personal mobile devices, for example, PDA, laptop

- emerging technologies as the result of convergence of computers and communications technology

- public information systems, for example, traffic control, security camera systems, public transfer information systems.

2.4   Integrated systems

2.4.1   Robotics

Social and ethical issues

Students must study and evaluate the social and ethical issues involved in the use of robotics. These may include:

- social and economic effects of replacing people with robots in the workplace

- ethical decisions regarding the use of robots in situations that might endanger human beings

- social impact of human interaction with robots, for example, artificial pets, robots for the disabled and elderly

- social impact and ethical 0 97aTtuations regarding the use of robotits imedifinets, for exampled

- reasons why robots are/are not designed as androids with human-like form

- the capabilities and limitations of robots with respect to vision, touch, sound and movement

- processing power in relation to the capabilities and limitations of robots.

2.4.2 Artificial intelligence and expert systems

Social and ethical issues

Students must study and evaluate the social and ethical issues involved in the use of artificial intelligence (AI) and expert systems. These may include:

- responsibility for the performance of an expert system—knowledge engineer, informant, programmer, company that sold it, the buyer/consumer

- value of the development of AI as a field, for example, whether it is an appropriate place to put economic resources

- ethical issues of various applications of AI, for example, replacement of human workers, handing decision-making tasks to a computer

- social impact of the use of "smart" machines on everyday life

- ethical issues related to military applications of AI, for example, smart weapons, reconnaissance, decision making

- implications of creative production by computers using AI, for example, Aaron, an expert system, creates visual art

- access to the knowledge base underlying an inference engine in an expert system, for example, whether people affected by decisions made using an expert system should have access to the rules by which the decision was made.

Knowledge of technology

In order to study and evaluate the social and ethical issues involved in the use of AI and expert systems, the student must have an understanding of related technological concepts. These may include:

- key terms—AI, Turing test, parallel processing, machine learning, natural language, common-sense knowledge, agent, pattern recognition, expert system, knowledge base, inference engine, heuristics, fuzzy logic, knowledge engineer, domain

- storage requirements for common-sense knowledge

- processing requirements for AI

- collection/creation of a knowledge base

- creation of an inference engine (for example, if/then rules, fuzzy logic)

- identifying domains that are suitable for expert systems.

Section 3: areas of impact

Students at SL are required to study part A and a minimum of **two** other areas of impact chosen from part B. Students at HL are required to study all **six** areas of impact.

The use of real-life situations based on current issues is recommended as an appropriate vehicle for the study of the areas of impact. The topics given under each area are provided **as examples only**. Teachers should use any relevant topics that integrate the areas of impact with social and ethical issues (section 1) and IT systems in a social context (section 2) as illustrated in the diagram at the beginning of the syllabus details. It is important that examples are drawn from the local, national and global level.

Part A

The study of this area of impact is **compulsory** for all students.

3.1 Business and employment

- Transportation: reservation systems, luggage processing, navigation, scheduling and distribution, traffic simulation, smart roads and cars, fuel efficiency and traffic safety systems

- Employment: electronic employee monitoring, telecommuting, ergonomics and health, job obsolescence and retraining, online job search, employee surveillance

- Banking and finance: EFT, ATMs, Internet banking and brokerage, electronic cash, insurance

- International commerce: management of transnational corporations, business concentration

- E-commerce: teleshopping, online marketing, data mining, spyware

- Retailing, advertising, media

Part B

Students at SL are required to study a minimum of **two** of the following areas of impact. Students at HL are required to study all **five** of the following areas of impact.

3.2 Education

- Telelearning: isolated and remote areas; use in hospitals, prisons, retirement homes

- Modification of hardware and software for special needs: voice recognition software, text-to-speech, special input and output devices, Internet resources

- Software in the classroom: science experiments, social studies modelling and simulation, instructional tools and media, computer-aided instruction, computer-aided learning

- School library systems: catalogues, security systems, online research

- Hardware in the classroom: laptops, notebooks, teleconferencing

- Software in school administration: record keeping, scheduling, Intranets, public information

- Training, tutorials, simulators

3.3   Health

- Telemedicine: service delivery to isolated and remote areas

- Electronic health records: privacy, data analysis, public health

- Diagnostic and therapeutic tools: robotic surgery, prosthetic devices, diagnostic software, drug development and marketing

- Medical advice on the Internet or a CD-ROM

- Monitoring patients

- IT solutions for disabled people

3.4   Arts, entertainment and leisure

- Digital art: electronic music, interactive visual art, desktop publishing

- Film: digital actor simulations, characters and animation

- Live arts: digital effects, choreography, lighting, marketing

- New media: DVD, CD, VR, stereolithography

- Broadcast media: digital radio and television, electronic news, magazines and books

- Toys and games: CD or online games, online gambling

3.5   Science and the environment

- Modelling and simulation: digital experimentation, demographic and environmental simulation

- Visualization: mapping

- Data search, collection, processing and analysis

- Forecasting

- Data logging

3.6   Politics and government

- Political process: voting and elections, lobbying, open government and free movement of information

- Government administration: record keeping, tax collection, policy implementation

- Legislation: policy development, enactment, enforcement and analysis

- Police: DNA data collection, video surveillance

- Military: cyberwarfare, smart weapons development, espionage

- Rebel and terrorist use of IT

Higher level

External assessment   80%

Written papers   4 hours

Paper 1   1 hour   20%

Four compulsory short-answer questions that assess in an integrated way sections 1 and 2 of the syllabus: social and ethical issues and IT systems in a social context.

Paper 2   2 hours   35%

Three structured questions from a choice of four on areas of impact.

Paper 3   1 hour   25%

Three questions based on a case study.

Internal assessment   20%

Portfolio and extension   20%

Students must produce:

- **three** pieces of written work on social and ethical issues based on three different areas of impact, each 800–1,000 words

- an extension to **one** of the portfolio pieces, 800–1,000 words.

Standard level

For first examinations in 2007

External assessment   70%

Written papers   3 hours

Paper 1   1 hour   25%

Four compulsory short-answer questions that assess in an integrated way sections 1 and 2 of the syllabus: social and ethical issues and IT systems in a social context.

Paper 2   2 hours   45%

Six structured questions that assess in an integrated way sections 1, 2 and3 of the syllabus: social and ethical issues, IT systems in a social context and areas of impact.

The paper is divided into two parts.

Part A: **one** compulsory question on business and employment.

Part B: five questions, one on each of the other areas of impact. Students are required to answer **two** questions from this section, each one on a different area of impact.

Internal assessment   30%

Project   30%

An IT solution to a problem set in a social context. Students must produce:

- a **product** developed through the integration of IT skills

- a written **report** (2,000–2,500 words)

- a **log book**.

Higher level

	External assessment			Internal assessment
	Paper 1	**Paper 2**	**Paper 3**	**Portfolio**
Assessment objectives	1,2,3,4	1,2,3,4	1,2,3,4,7,8	4,6,7,8,9
Syllabus content	social and ethical issues and IT systems in a social context	social and ethical issues, IT systems in a social context and areas of impact	social and ethical issues, IT systems in a social context and areas of impact	social and ethical issues and IT systems in a social context
Method	4 short-answer questions	3 structured questions from a choice of 4 on areas of impact	3 questions based on a case study	3 pieces of work, 800–1,000 words each, plus extension on one of the pieces (800–1,000 words)
Component time	1 hour	2 hours	1 hour	20 hours plus 10 hours for extension
Assessment weighting	20%	35%	25%	20%

Standard level

	External assessment		Internal assessment
	Paper 1	Paper 2	Project
Assessment objectives	1,2,3,4	1,2,3,4	4,5
Syllabus content	social and ethical issues and IT systems in a social context	social and ethical issues, IT systems in a social context and areas of impact	social and ethical issues and IT systems in a social context
Method	4 short-answer questions	structured questions on areas of impact: one compulsory question and 2 further questions from a choice of 5	log book, product and report
Component time	1 hour	2 hours	20 hours
Assessment weighting	25%	45%	30%

Comparison of HL and SL assessment models

	Higher level	Standard level
External assessment		
Paper 1 (common paper)	20% 1 hour	25% 1 hour
Paper 2	35% 2 hours 3 questions from 4	45% 2 hours 1 compulsory and 2 optional questions
Paper 3	25% 1 hour 3 questions based on a case study	
Internal assessment		
Portfolio	20% 20 hours plus 10 hours 3 pieces of work plus 1 extension	
Project		30% 20 hours product, report and log book
Teaching hours	240	150

General

The method of assessment used by the International Baccalaureate Organization (IBO) is criterion-referenced, not norm-referenced: the method of assessment judges the students' work by their performance in relation to identified assessment criteria and not in relation to the work of other students.

Two different methods are used to assess the ITGS course: detailed markschemes specific to each examination paper; and achievement level descriptors. The descriptors are published in this guide.

- For papers 1, 2 and 3 there are markschemes specific to each examination.

- For internal assessment a number of assessment criteria have been identified. Each assessment criterion has descriptors describing specific levels of achievement together with the appropriate range of marks.

- The descriptors concentrate on positive achievement, although for the lower levels failure to achieve may be included in the description.

External assessment   HL 80%   SL 70%

The external assessment consists of three written examination papers (papers 1, 2 and 3) for the HL course and two papers (papers 1 and 2) for the SL course. The external assessment components contribute 80% of the marks at HL and 70% at SL.

Written papers
Paper 1 (1 hour)   HL and SL common paper   HL 20%   SL 25%

- This paper consists of four compulsory short-answer questions that assess in an integrated way sections 1 and 2 of the syllabus, social and ethical issues and IT systems in a social context.

- Each question will normally be structured, with up to four parts. The number of marks for each part will be given on the paper and this will indicate to students the depth of response required for each part.

- One question only may be a data-response question.

- This paper will assess knowledge and understanding of social and ethical issues and IT systems and also the student's ability to analyse and evaluate the impact of IT, using relevant supporting examples (objectives 1 and 2 of the course).

- The maximum mark for each question is 10.

- The maximum mark for this paper is 40.

Paper 2 (2 hours)   HL only   35%

- This paper consists of four structured, data-response questions that assess in an integrated way the three sections of the syllabus: social and ethical issues, IT systems in a social context and areas of impact.

- Each question is drawn from one or more of the six areas of impact:

    - business and employment

    - education

    - health

    - arts, entertainment and leisure

    - science and the environment

    - politics and government.

Students are required to answer three questions.

- Each question will normally be structured, with up to four parts. The number of marks for each part will be given on the paper and this will indicate to students the depth of response required for each part.

- This paper will assess knowledge and understanding of social and ethical issues related to a particular area, or areas of impact. Knowledge of IT systems alone will not normally be assessed though students will need to give examples of IT systems in their answers. This paper will also assess the student's ability to analyse and evaluate the impact of IT, using relevant supporting arguments and examples (objectives 1, 2, 3 and 4 of the course).

- The maximum mark for each question is 20.

- The maximum mark for this paper is 60.

Paper 2 (2 hours)   SL only   45%

- This paper consists of six structured questions based on the areas of impact that assess in an integrated way the three sections of the syllabus: social and ethical issues, IT systems in a social context and areas of impact.

- The paper is divided into two parts: a compulsory part A, and part B.

    Part A consists of one compulsory question on business and employment.

    Part B consists of five questions, one on each of the other areas of impact:

    - education

    - health

    - arts, entertainment and leisure

    - science and the environment

    - politics and government.

Students are required to answer two questions in part B.

- Each question will normally be structured, with up to four parts. The number of marks for each part will be given on the paper and this will indicate to students the depth of response required for each part.

- This paper will assess knowledge and understanding of social and ethical issues related to a particular area of impact. Knowledge of IT systems alone will not normally be assessed, though students will need to give examples of IT systems in their answers. This paper will also assess the student's ability to analyse and evaluate the impact of IT, using relevant supporting arguments and examples (objectives 1, 2, 3 and 4 of the course).

- The maximum mark for each question is 20.

- The maximum mark for this paper is 60.

Paper 3 (1 hour)   HL only   25%

- This paper is based on a case study, produced by the IB and made available to schools one year ahead of the examination. The paper consists of three questions focusing on IT systems and social and ethical issues related to the case study.

The case study

Introduction
The ITGS case study is a teaching tool and the stimulus material for the questions on paper 3. It will investigate a real-life situation involving IT in a global society.

The case study approach is well suited for IT research, and should provide an invitation for further investigation on similar areas of impact in the local and global community.

This case study will be provided 12 months before the examination session so that students can thoroughly analyse the real-life situation in the local and global context and prepare for paper 3.

The case study is a valuable teaching tool that will help integrate all the areas of the curriculum.

Assessment
The investigative work done with this case study will prepare students for questions in paper 3, consisting of 25% of the final mark.

Paper 3 will be a one-hour examination consisting of **three** questions assessing objectives 1, 2, 3, 4, 7 and 8.

Additional information may be provided in the examination questions to allow students to generate new ideas.

Explanation of the process
The case study is intended as an open-ended scenario. Work done on the case study should reflect the integrated approach explained on page 8. The model on page 8 will also guide the scope of the investigation.

Students are expected to research, analyse, evaluate, synthesize and reflect on ideas from their investigation.

Through their investigation of the case study students should be able to:

- apply the social and ethical issues (pages 11–12)

- investigate the IT systems in a social context related to the case study

- relate areas of impact to other similar local and global situations

- project on future developments, challenges, solutions, improvements, cause and effect, and different approaches in the local and global environment considering IT systems.

Information may be gathered from local/global sources including field trips, interviews, primary and secondary research, inviting guest speakers, and online interviews.

- The maximum mark for this paper is 30.

Internal assessment   HL 20%   SL 30%

General

Internal assessment is an integral part of the ITGS course and is compulsory for students. It enables students to demonstrate the application of their skills and knowledge in ITGS and to pursue their personal interests without the time constraints associated with written examinations.

Guidance and authenticity

The HL portfolio and extension and the SL project submitted for internal assessment must be the student's own work.

It is the responsibility of the teacher to ensure that students are familiar with:

- the requirements of the type of work to be internally assessed

- the assessment criteria.

Teachers and students must discuss the work to be undertaken for the HL portfolio and extension, or for the SL project. Students should be encouraged to initiate discussions with the teacher to obtain advice and information, and students must not be penalized for seeking guidance. However, if a student could not have completed the work without substantial support from the teacher, this should be recorded on the appropriate form from the *Vade Mecum*.

Teachers must explain clearly to students that the internally assessed work must be entirely their own, and that each student is required to sign a written declaration to this effect, verified by the teacher, when they submit their work for internal assessment. All ideas and work of other persons, regardless of their source, must be acknowledged. If the ideas or work of another person are represented as being the student's own, the student is guilty of plagiarism. The consequences of being found guilty of plagiarism may be that no subject grade or diploma are awarded.

Teachers are required to ensure that the work submitted is the student's own. If in doubt, authenticity may be checked by discussion with the student on the content of the work, and scrutiny of one or more of the following:

- the student's initial proposal

- the first draft of the written work

- the references cited

- the style of writing compared with work known to be that of the student.

Schools may also wish to use an external checking service to verify authenticity.

As part of the learning process, teachers can give advice to students on a first draft of an HL portfolio piece, the HL portfolio extension, or the SL project report. This advice should be in terms of the way the work could be improved but this draft must not be heavily annotated or edited by the teacher. Constant drafting and redrafting is not allowed and the next version handed to the teacher after this first draft must be the final one.

The same piece of work cannot be submitted to meet the requirements of both the internal assessment and the extended essay.

Time allocation

Internal assessment is an integral part of the ITGS course, contributing 20% of the marks at HL and 30% at SL. This weighting should be reflected in the time allocated to teaching the internally assessed components.

It is recommended that a total of approximately 20 hours should be allocated to the HL portfolio and 20 hours to the SL project. It is recommended that 10 hours should be allocated to the HL portfolio extension. This should include:

- time for the teacher to explain to students the requirements of the component

- class time for students to work on their study

- additional time outside normal class time for students to work on their own

- time for consultation between the teacher and each student

- time to review and monitor progress, and to check authenticity.

Using the internal assessment criteria

- There are separate assessment criteria for the HL portfolio (A–F), the SL project (G–M) and the HL portfolio extension (N–R).

- Teachers should judge the internally assessed work against the criteria using the achievement level descriptors.

1. For each assessment criterion there are descriptors that concentrate on positive achievement.

2. The aim is to find, for each criterion, the descriptor that conveys most accurately the level attained by the student's work using the best-fit model.

3. When assessing a student's work, teachers should read the descriptors for each criterion until they reach a descriptor that most appropriately describes the level of the work being assessed. If a piece of work seems to fall between two descriptors, both descriptors should be read again and the one that more appropriately describes the student's work should be chosen.

4. Where there are two or more marks available within an achievement level, teachers should award the upper marks if the student's work demonstrates most or all of the qualities described. Teachers should award the lower marks if the student's work demonstrates some of the qualities described.

5. Only whole numbers should be recorded: partial marks, fractions and decimals are not acceptable.

6. Teachers should not think in terms of a pass/fail boundary but should concentrate on identifying the appropriate descriptor for each assessment criterion.

7. The highest descriptors do not imply faultless performance but should be achievable by a student. Teachers should not hesitate to use the extremes if they are appropriate descriptions of the work being assessed.

8. A student who attains a high level of achievement in relation to one criterion will not necessarily attain high levels of achievement in relation to the others. Teachers should not assume that the overall assessment of the students will produce any particular distribution of scores.

9. It is recommended that the assessment criteria and their descriptors be available to students at all times.

The portfolio   HL only   20%

Introduction

The HL portfolio consists of three pieces of work, each based on a different news item, and produced as a result of research and discussion. The use of a news item as the basis of the piece of work is to encourage students to examine the impact of IT on everyday events at the local, national and global level. The emphasis is on the social and ethical considerations arising from the widespread use of IT in society. Students should apply the methodologies for analysing the social impacts and ethical considerations of IT provided in the syllabus details. The three sections of the syllabus can be integrated very effectively in the pieces of work produced for the portfolio.

Requirements

- The portfolio consists of **three** pieces of written work.

- Each piece of work must be based on a **different** area of impact as specified in section 3 of the syllabus.

    - 3.1 Business and employment

    - 3.2 Education

    - 3.3 Health

    - 3.4 Arts, entertainment and leisure

    - 3.5 Science and the environment

    - 3.6 Politics and government

- Each piece should be 800–1,000 words in length. The list of references under criterion E is not included in the word count.

- Each piece must be based on a news item published not more than six months prior to the commencement of the course and written in the working language of the school.

- Students should select their own news items, although teachers can direct them to appropriate sources. Students may use the same news item for their stimulus material but collaborative work is not allowed. News items used as the basis for class discussion must not be used for the individual student's piece of work.

- The news item can be taken from any published source (newspaper, journal, the Internet) and should be a short article or extract.

- The student's piece of work must focus on the content and context presented in the news item. For example, if the news item is about the use of an IT system in a hospital and the student identifies social and ethical issues related to security and integrity of data, these must be examined in the context of a hospital as presented in the news item. The piece of work must not be a general discussion of these issues in any situation.

- The news item must be attached to the piece of work. If a student uses selected parts of a longer article, these should be highlighted on the news item sent to the moderator.

- A mark of zero will be awarded if the piece of work is not based on a news item.

Presentation

- Each piece of work must address the assessment criteria A–E. The assessment criteria headings A–E must be used as sub-headings in each piece of work that is included in the portfolio. This method enables students to present their work in a structured and coherent way.

- Each news item may raise one or more social or ethical issues related to an IT system and the student presents these issues under **criterion A**. It is essential that the student relates the issues to the specific context presented in the news item. Not every news item will present both social and ethical issues but across the three pieces of work in the portfolio the student must ensure that both social and ethical issues are examined. The social and ethical issues identified by the student are likely to fall into the categories in section 1 of the syllabus. However, developments in technology may raise new and different issues and students can write about these as long as they are clearly identified and described. The student must always make it clear which area of impact (section 3 of the syllabus) the news item is linked to.

- Under **criterion B** the student presents the IT background of the issue, referring to concepts, developments and trends.

- Under **criterion C** the student considers the impact of the issue on society. This may be at the local, national or global level depending on the focus of the news item. The use of IT in a particular area is likely to bring both advantages and disadvantages that the news item may or may not discuss directly. The student should consider both advantages and disadvantages. It is important that the student identifies at least one problem related to the use of IT in this area of impact because this leads into criterion D.

- Under **criterion D** the student looks for a solution to one problem identified in criterion C.

- It is essential that the student undertakes further research into the issues raised by the news item and a minimum of three other sources in addition to the news item should be used. A list of these further resources is provided under **criterion E**.

Record keeping

Each portfolio piece must be presented in chronological order. The following information must be provided for each piece.

- Title

- Date completed

- Area of impact (section 3) to which the piece is related

- Number of words

Assessing the portfolio

- The teacher must use the following criteria and their descriptors to assess the student's portfolio.

- The final mark for each criterion is not an average of the three pieces of work. Teachers should review the three pieces of work included in the portfolio and for each criterion award the mark that best represents the level of achievement reached by the student at the end of the course. The final mark for each criterion must have been achieved on at least one of the pieces of work in the portfolio.

- If any piece of work is obviously greater than the word limit, the external moderation will be based on the first thousand words.

- If fewer than three pieces of work are submitted the marks must be adjusted proportionally.

- The assessment weighting of this component (including the extension at HL) is 20%.

Assessment criteria for the portfolio

The portfolio is assessed against six criteria that are related to the assessment objectives of the ITGS course.

Criterion A	Presentation of the issue	4 marks
Criterion B	The IT background of the issue	5 marks
Criterion C	The impact of the issue	5 marks
Criterion D	A solution to a problem arising from the issue	5 marks
Criterion E	Selection and use of sources	2 marks
Criterion F	Expression of ideas relevant to the social issue	4 marks
	Total	25 marks

A   Presentation of the issue

- Failure to refer to the news item will result in a penalty of 1 mark.

Level	Descriptor
0	Level 1 is not achieved or the news item is in the same area of impact as a previous piece of work.
1	The student identifies an appropriate social and/or ethical issue related to an IT system.
2	The student outlines an appropriate social and/or ethical issue related to an IT system.
3	The student describes an appropriate social and/or ethical issue related to an IT system.
4	The student explains an appropriate social and/or ethical issue related to an IT system.

B   The IT background of the issue

Level	Descriptor
0	Level 1 is not achieved.
1	The student states the IT background (concepts, plus developments and/or trends) relevant to the issue.
2	The student outlines the IT background (concepts, plus developments and/or trends) relevant to the issue.
3	The student describes the IT background (concepts, plus developments and/or trends) relevant to the issue.

Level	Descriptor
4	The student explains the IT background (concepts, plus developments and trends) relevant to the issue.
5	The student analyses the IT background (concepts, plus developments and trends) relevant to the issue.

C   The impact of the issue

Level	Descriptor
0	Level 1 is not achieved.
1	The student outlines the impact of the issue on society, and identifies at least one related problem.
2	The student describes the impact of the issue on society, and identifies at least one related problem.
3	The student explains the impact of the issue on society, and identifies at least one related problem.
4	The student analyses (citing supporting research) the impact of the issue on society, and identifies at least one related problem.
5	The student evaluates (citing supporting research) the impact of the issue on society, and identifies at least one related problem.

D   A solution to a problem arising from the issue

- The solution must address **one** problem identified in criterion C. A non-IT solution is acceptable.

- If the problem has not been identified in criterion C or D, the student receives no marks for criterion D.

Level	Descriptor
0	Level 1 is not achieved.
1	The student states a feasible solution to the problem identified in criterion C.
2	The student outlines a feasible solution to the problem identified in criterion C.
3	The student describes a feasible solution to the problem identified in criterion C.
4	The student explains a feasible solution to the problem outlined in criterion C.
5	The student evaluates a feasible solution to the problem identified in criterion C.

E   Selection and use of sources

- Use any standard format for bibliography and footnotes.

- A copy of the news item must be attached to the piece of work.

Level	Descriptor
0	Level 1 is not achieved or the news item is not attached.
1	The student has provided a list of references (minimum 4, including the news item).
2	The student has provided a list of references (minimum 4, including the news item) and properly cited those references in the text.

F   Expression of ideas relevant to the social issue

Level	Descriptor
0	Level 1 is not achieved.
1	The student expresses ideas with supporting arguments.
2	The student expresses ideas with supporting arguments and relevant examples.
3	The student expresses ideas coherently with supporting arguments and relevant examples.
4	The student expresses ideas coherently with supporting arguments and extended relevant examples.

The project   SL only   30%

Introduction

The emphasis of the project is on solving a problem, set firmly in a social context, that affects the ways in which individuals, organizations and groups access and use information. Only projects that solve an actual problem should be undertaken. Although a simple solution can often be an appropriate response to a particular problem, students are encouraged to undertake challenging tasks to develop their IT skills and increase their awareness of the social impact of providing a feasible IT solution to a specific social problem.

The making of the product, the writing of the report, and the keeping of the log book must be undertaken by the student on an individual basis. Collaborative work is not allowed.

In identifying a problem set in a social context, students can select any topic that interests them. It need not be related directly to any of the areas of impact in the syllabus and the problem identified can be inside or outside the school environment.

One approach that students may find helpful and that is quite acceptable is to draw on material from other parts of the Diploma Programme where an IT solution could be found to a social problem. Examples could include:

- providing an interactive presentation for the biology teacher (client/end-user) from information and photographs that were collected from a biology field study. The IT product will be used as preparatory material for the following year's students (end-users)

- creating an IT product for the theatre arts teacher (client/end-user) to map backstage activities for a drama production

- developing an IT product for the history teacher (client/end-user) to solve the problem of teaching facts about the impact of Hitler during the second world war to grade 7 students (end-users).

Requirements

The project consists of three parts (product, report, log book), all of which must be submitted for moderation.

Product

The end product is the IT solution to the problem identified in criterion G. This must include the integration of at least three different IT skills. All products must be submitted in electronic form on either CD-ROM or DVD. Products that are web sites should include the URL address within the report. Products that involve printed documents (ie database reports) or desktop published documents must be submitted in their final published form and electronically on CD-ROM or DVD. Students are encouraged to save their documents on CD-ROM or DVD in the original format as well as in another format (ie PDF document, QuickTime or other cross-platform format). For further description, please see "Assessing the project" on pages 44–45.

Report

The report is a document of 2,000–2,500 words describing the process involved in the development, testing and implementation of the project. The report must be written in the order of the assessment criteria and the assessment criteria headings must be used as sub-headings in the report.

Visual documentation from the product in the form of screenshots, graphs, storyboards, photographs and similar visual evidence must be integrated into the body of the report under the appropriate sub-headings. The text in the report should refer to the visual evidence.

Questionnaires must be used in the formal testing of the product and the completed questionnaires must be included in the appendices of the report. Any appendices will not be included in the word count of the report.

Log book

The log book is a chronological record of the entire process used by the student throughout the development of the product. The log book is assessed and maintaining it is mandatory.

The log book contains regular, dated entries from analysing, planning, testing, implementing and evaluating the process and product. Regular dated entries of the process and product must be recorded in the log book. These include references for information, sketches and designs, screenshots, evaluative comments, crossings out, subject statements and other appropriate entries. It will document the student's actions and thoughts throughout the development process. It is normal for the log book to be handwritten.

The log book is intended primarily as a means of improving skills of organization, documenting the process of development and as an aid to problem solving for the student.

Explanation of the process

Identifying a problem within a social context

The student must identify and describe a problem set in a social context, and the person(s) who will be the client/end-user of the IT solution. The client is the person(s) who needs the IT solution or product to be developed. The end-user is the person(s) who will actually be using the product. For some projects the client is also the end-user. The client would be involved in all stages of the process.

The following key questions should be considered.

- What is the present system? How does it work? What are the limitations of the current system?

- What is the problem?

- Who will benefit from an IT solution? A specific IT solution must not be identified at this stage.

- Has the need been determined through discussions with relevant people, including client(s), end-user(s) and other stakeholders?

Analysing the problem

The student will collect relevant information, identifying client/end-user needs, and explain **two** distinct IT approaches to meet these needs. For example, in order to publicize a particular project in a school, two distinct possible approaches would be:

- to produce a brochure by using a desktop publishing program

- to create a web site.

However, a brochure produced by a word processor and a desktop publishing program are **not distinct** approaches. Similarly, producing a web site by using two different methods are **not distinct** approaches. Projects that do not use two distinct approaches will be penalized (see criterion H).

The following key questions should be considered.

- What is the relevant information that is needed for solving the problem?

- Have all the relevant stakeholders been consulted?

- Has all the necessary information been collected?

- What information is available about other IT solutions that have been used in similar situations?

- What hardware and software are currently available?

- Have the two approaches been completely described? Students should relate each approach back to the way it would address the need and the requirements of the end-user(s).

- Have the advantages and disadvantages of each of the approaches been identified?

- Have two feasible and distinct IT approaches been identified?

Considering the feasibility of alternative IT solutions

The student is expected to compare the feasibility of two approaches. Assessing the feasibility means considering the appropriateness of the solution in this social context, the availability of technical and human resources and the cost effectiveness.

The following key questions should be considered.

- Which approach best meets the needs of the client/end-user(s)? It is possible that one approach best meets the needs of the client/end-user(s) but because of other advantages and disadvantages, the other approach is selected.

- Is it clear which approach will be selected and why?

Planning and developing the chosen IT solution

The IT solution must be one of the feasible approaches identified above. Based on research, the investigation of various solutions, and the factors involved (data, stakeholders, software, hardware, procedures and policies), a final plan is developed.

The following key questions should be considered.

- What data is required?

- Who are the client/end-users?

- What specific software (title, company, version) is required and is its choice justified?

- What hardware (model, specifications) is required and is its choice justified?

- What technical support is required?

- What are the details of the time line?

- Are storyboard(s), diagrams, or other design details required to make the product?

- Has the testing strategy (who, what, when, where for beta and end-user testing) been formulated?

- What are the client/end-user training requirements?

- What related procedures and policies are required?

- Is the design clear enough to allow replication by a third party?

The details of the final plan should be recorded in the project report under criterion I, even though they are recorded in the logbook. The logbook should contain the original plan. The final plan in the project report may contain necessary modifications of the original plan.

Making the product

The student creates the product and uses visual evidence or screenshots in criterion I to explain the process of how the product was made. During this process, the student modifies the product as necessary and collects informal testing information and opinions from the ITGS teacher and fellow students. This phase is considered alpha testing and an ongoing process until the students feels that the product is ready for beta testing (formal testing).

The following key questions should be considered.

- Does the product work technically?

- Does the product contain all the data that is required?

- Does the product meet the needs of the client/end-user(s)?

- Is the product effective and fully functional?

Testing and evaluating the solution

Formal testing is conducted by requiring the beta tester and the client/end-user to record their observations on a questionnaire. The completed questionnaires and the handwritten responses must be included in the appendices.

Within the report, the student must include the names of the persons who are involved in the beta testing and client/end-user testing and state why they are qualified to do this formal testing.

The student must explain the process by which the solution was beta tested (formally tested for technical flaws), refined and then beta tested again by a different person. The student must explain the modifications. Before and after screenshots can be included to assist in explaining how the change has improved the product.

The last phase of formal testing is by the client/end-user who was identified in the "identifying the problem" phase. The client/end-user must evaluate the solution to ensure that the product meets the social need.

The following key questions should be considered.

- Has the product been beta tested for technical and design flaws?

- Has the product been tested for content?

- Has the product been formally tested by the client/end-user?

- Have all testing processes been formally documented?

Assessing the social significance of the product

The student must identify and explain two distinct social impacts of the product.

- The observed social impact must emerge from the development or use of the product by client/end-user(s).

- The projected social impact arises from the student's perspective of how this product could be used in the future in a wider setting.

The social impact of the product may emerge as the student observes the client/end-user in the testing process and the reactions of the client/end-user when the final product is made available. Students should record their observations in the log book. The student should consider what the impact of the product would be if its use was expanded or used in a wider setting.

Assessing the project

The teacher must use the following assessment criteria and their descriptors to assess the student's project.

- Criteria G, H, I, J and K must be assessed using evidence present in the project report. Evidence from the log book will not be considered in assessing these criteria. Completed questionnaires must appear in the appendix of the report to support the formal testing process described in criterion J.

- Criterion L must be assessed by the teacher using evidence provided by the actual product, together with visual evidence contained in the project report under criterion I and in the appendix. Approximately 8–10 screenshots with documentation must be included in the appendix for any product submitted only in electronic form. These screenshots should demonstrate the key features of the product. The appendix should also contain details of how to access or open the electronic versions of products that are submitted. In cases where the product is produced using desktop publishing, the final printed product must be submitted. Electronic versions of products can be submitted by providing the URL address, providing a downloadable document in a common format, or providing a CD-ROM or DVD. Zip disks, floppy disk, video/audio tapes or other media are not suitable.

- Criterion M is assessed using only the evidence included in the log book.

- The assessment weighting of this component is 30%.

Assessment criteria for the project

The project is assessed against seven criteria that are related to the objectives of the ITGS course.

Criterion G	Identifying the problem within a social context	3 marks
Criterion H	Analysis and feasibility study	4 marks
Criterion I	Planning and developing the chosen IT solution	10 marks
Criterion J	Testing and evaluating the solution	6 marks
Criterion K	Assessing the social significance of the product	3 marks
Criterion L	The product	6 marks
Criterion M	The log book	3 marks
	Total	35 marks

G   Identifying the problem within a social context

- If the problem is not set in a social context or the student does not identify a specific client or end-user(s), a mark of zero is awarded.

Level	Descriptor
0	Level 1 is not achieved.
1	The student outlines the problem in a social context and identifies an end-user.
2	The student describes the problem in a social context and identifies an end-user.
3	The student describes the inadequacies of the present situation, describes the problem in a social context, and identifies an end-user.

H   Analysis and feasibility study

- The student is expected to analyse two feasible and distinct IT approaches to the solution of the problem.

Level	Descriptor
0	Level 1 is not achieved.
1	The student describes two distinct IT approaches that address the problem.
2	The student describes two distinct IT approaches that address the problem, and compares their advantages and disadvantages.
3	The student satisfies the descriptor for 2 marks and justifies the chosen approach with reference to its feasibility.
4	The student satisfies the descriptor for 3 marks and justifies the chosen approach by explaining how it solves the problem.

I   Planning and developing the chosen IT solution

- The student should provide the following information related to the planning of the IT solution. A maximum of 10 marks is available for this criterion. Each of the five areas listed below is marked independently.

Level	Descriptor
0–2	The student has provided a detailed schedule of the events and processes involved in the planning, making, implementation and testing of the product. This includes who does what, and when.
0–2	The student has provided visual evidence of the design and making of the product, either as a storyboard or as detailed diagrams and screenshots from the product.
0–2	The student has described the software required (including title, company, version) and described how it is used.
0–2	The student has described the hardware required (including model and specifications) and described how it is used.
0–2	The student has described the source and/or collection of appropriate data required for a comprehensive solution to the problem.

J   Testing and evaluating the solution

- These two types of testing are called beta testing and end-user testing. The student is required to use the cycle: beta test, refine, beta test, refine, end-user test, refine. For each stage of testing, the student must make appropriate revisions to the project, justifying the modifications. Evidence of the formal testing must appear in the appendix in the form of a questionnaire and responses from the testers. A mark of zero is awarded if there is no evidence of formal testing.

Level	Descriptor
0	Level 1 is not achieved.
1	The student describes testing by one beta tester and explains why they are a qualified beta tester, but there is no refinement to the product.
2	The student describes testing by one beta tester and explains why they are a qualified beta tester, and there is one justified refinement to the product.
3	The student describes testing by two testers (beta and end-user, or two beta) and explains why they are qualified testers, and there is one justified refinement to the product.
4	The student describes testing by two testers (beta and end-user, or two beta) and explains why they are qualified testers, and there are two justified refinements to the product.
5	The student describes testing by two beta testers and an end-user and explains why they are qualified testers, and there are two justified refinements to the product.
6	The student describes testing by two beta testers and an end-user and explains why they are qualified testers, and there are three justified refinements to the product.

K   Assessing the social significance of the product

Level	Descriptor
0	Level 1 is not achieved.
1	The student describes one social impact (observed or projected) of the project.
2	The student describes one observed and one projected social impact of the project.
3	The student explains one observed and one projected social impact of the project.

L   The product

- The product is submitted with the project report and the log book. If no product is submitted or the product is not a solution to the problem identified in criterion G, a mark of zero is awarded for this criterion. Marks will be awarded by reference to the product, together with visual evidence contained within the project report and the 8–10 screenshots with documentation contained in the appendices. A maximum of 6 marks is available for this criterion. Each of the three areas listed below is marked independently.

Level	Descriptor
0–2	2 marks are awarded if the product is technically fully functional. 1 mark is awarded if the product is partially functional. A mark of 0 is awarded if the product is not functional.
0–2	The product is appropriately designed. A mark of 0 is awarded if the product is not appropriately designed.
0–2	The student has developed a comprehensive solution for a complex task. A mark of 0 is awarded for a simple solution.

M   The log book

- The log book contains regular, dated entries from analysing, planning, testing, implementing and evaluating the process and product. These include references for information, sketches and designs, evaluative comments and other appropriate entries recorded throughout the entire process from criterion G through K.

Level	Descriptor
0	Level 1 is not achieved.
1	The log book contains regular, dated entries recording what the student has done throughout the whole period when the project was developed.
2–3	The requirements for 1 mark are met and there is evidence from each of the five stages (analysing, planning, testing, implementing and evaluating the process and product).

The portfolio extension   HL only

Introduction

The extension to the portfolio consists of an interview undertaken to investigate an issue raised in one of the portfolio pieces. The student will be expected to relate results of the interview to their research in the original portfolio piece. The structured interview can be conducted using a range of methodologies such as personal interview, responses by e-mail, phone or fax. Where appropriate, students may wish to conduct more than one interview and compare the different perspectives.

Requirements

The portfolio extension should be 800–1,000 words in length. The word limit does not include the appendix. It consists of a report and an appendix that contains the questionnaire and the summary of the interview(s) (transcript with questions and answers, summary of responses, quotes). The student may determine the most appropriate format for reporting the interview. The summary of the interview must include a header with the name of the person interviewed, qualification/position, name/address of organization, date/place of interview.

As a result of the interview, the student may wish to interview up to two other individuals who are knowledgeable about the issue and may contribute supportive or conflicting views. Full transcripts are not necessary. The student should provide fully referenced summaries and quotes to support their findings.

If the portfolio extension is obviously greater than the word limit, the external moderation will be based on the first 1,000 words.

Presentation

The portfolio extension includes:

- coversheet that clearly identifies the portfolio title and the issue being addressed

- report addressing assessment criteria N–R

- appendix containing the summary of the interview(s).

The report must be written using the criteria headings N–P.

Assessment criteria for the HL portfolio extension

The portfolio extension is assessed against five criteria that are related to the objectives of the HL ITGS course.

Criterion N	Discussion and analysis of the interview	3 marks
Criterion O	Reflection on the interview	4 marks
Criterion P	Projection of broader implications from the interview and portfolio research	4 marks
Criterion Q	Interview process • Appropriateness of the choice of the interviewee • Appropriateness of the interview questions • Comprehensive record of the interview(s)	7 marks
Criterion R	Quality of communication	2 marks
	Total	20 marks

N   Discussion and analysis of the interview

Level	Descriptor
0	The student has not achieved level 1.
1	The student describes the interview and refers to the summary of the interview.
2	The student discusses the interview and refers to the summary of the interview with some analysis.
3	The student discusses the interview and refers to the summary of the interview with extensive analysis.

O   Reflection on the interview

Level	Descriptor
0	Level 1 is not achieved.
1	An attempt has been made to relate ideas arising from the interview to the portfolio research.
2	There is some reflection on ideas arising from the interview and applied to the portfolio research with supportive examples.
3	There is an extensive reflection on ideas arising from the interview and applied to the portfolio research with supportive examples.
4	There is an extensive reflection on ideas arising from the interview and applied to the portfolio research with supportive examples and new relationships are established.

P   Projection of broader implications from the interview and portfolio research

Level	Descriptor
0	The student has not achieved level 1.
1	An attempt has been made to project implications as a result of the interview or the portfolio research.
2	There is some projection of implications as a result of the interview or the portfolio research.
3	There is some projection of implications as a result of the interview and the portfolio research with supportive examples.
4	There is an extensive projection of implications as a result of the interview and portfolio research with supportive examples.

Q   Interview process

Level	Appropriateness of the choice of the interviewee
0	The choice of interviewee is not appropriate.
1	The choice of interviewee is appropriate.

Level	Appropriateness of the interview questions
0	There is no record of the interview questions.
1–2	The interview questions are partially appropriate.
3	The interview questions are appropriate.

Level	Comprehensive record of the interview(s)
0	There is no record of the interview(s).
1–2	There is a partial record of the interview(s).
3	There is a comprehensive record of the interview(s).

R   Quality of communication

Level	Descriptor
0	The student has not achieved level 1.
1	The student expresses arguments in a coherent or structured manner.
2	The student expresses arguments in a coherent and structured manner.

This is a list of IT abbreviations used in this guide.

AI	Artificial intelligence
ASCII	American standard code for information interchange
ATM	Automated teller machine
CAD	Computer-aided design
CAI	Computer-aided instruction
CAL	Computer-aided learning
CD	Compact disk
CD-ROM	Compact disk read-only memory
dpi	Dots per inch
DTP	Desktop publishing
DVD	Digital versatile disk
EDI	Electronic data interchange
EFT	Electronic funds transfer
FTP	File transfer protocol
GB	Gigabyte
GUI	Graphical user interface
HTTP	Hypertext transfer protocol
IP	Internet protocol
KB	Kilobyte
LAN	Local area network
MB	Megabyte
MHz	Megahertz
MIDI	Musical instrument digital interface
MP3	MPEG audio layer 3
OCR	Optical character recognition
OMR	Optical mark reader

PDA	Personal digital assistant
PDF	Portable document format
RAM	Random access memory
ROM	Read only memory
RTF	Rich text format
SSL	Secure socket layer
TB	Terabyte
TCP	Transmission control protocol
UPS	Uninterruptible power supply
URL	Uniform resource locator
VPN	Virtual private network
VR	Virtual reality
WAN	Wide area network
WWW	World Wide Web

Command term	Definition—asks students to:	ITGS example
analyse	break down in order to bring out: • the essential elements • structure • any underlying assumptions and any interrelationships involved.	Analyse the impact of introducing an Internet use policy into a workplace. (6 marks)
compare	describe two (or more) situations and present the similarities between them.	In ITGS the phrase "describe the similarity between …" will be used instead of compare. Describe one similarity between an Intranet and the Internet. (2 marks)
contrast	describe two (or more) situations and present the differences between them.	In ITGS the phrase "describe the difference between …" will be used instead of "contrast". Describe one difference between a flat-file database and a relational database. (2 marks)
define	give a clear and precise meaning of a given word, term or concept.	Define the term data redundancy. (2 marks)
describe	present the characteristics of a particular topic.	Describe one use of information technology in a dentist's office. (2 marks)
discuss	offer a considered and balanced review of a particular topic. Opinions or conclusions should be presented clearly and supported by empirical evidence and sound argument.	Discuss how a client–server network can help provide reliable IT services to a company. (5 marks)
distinguish	make clear the differences between two or more concepts/terms.	Distinguish between a computer model and a computer simulation. (3 marks)
evaluate	make an appraisal by weighing up the strengths and limitations of different evidence and arguments.	The network administrator has proposed a backup system for the library that creates a full backup every Friday. Evaluate this proposal. (8 marks)

examine	consider an argument or concept in a way that uncovers the assumptions and interrelationships of the issue.	Examine two benefits of adopting consistent interface standards throughout the company. (4 marks)
explain	describe, giving reasons.	Explain one way that facial recognition technology can assist an airline traveller. (3 marks)
identify	recognize and state briefly a distinguishing fact or feature.	Identify the protocol used to transmit web pages. (1 mark)
to what extent	evaluate the success or otherwise of an argument or concept. Opinions and conclusions should be presented clearly and supported with empirical evidence and sound argument.	Ordinary citizens have been able to capture world events using their camera phones. These pictures can be sent to newspapers for immediate publication. To what extent is freedom of information outweighed by a potential invasion of the privacy of individuals being photographed. (10 marks)

The following resources are available to support the ITGS course.

Online Curriculum Centre (OCC)

http://online.ibo.org

ITGS documents

1. *Information technology in a global society guide* for first examinations at HL in 2006 and at SL in 2004, published March 2004

2. *Information Technology in a Global Society Teacher Support Material: Internal Assessment*, published August 2002 (available from the school DP coordinator)

3. Specimen papers 1 and 2 at SL and specimen papers 1, 2 and 3 (case study) at HL (available on the OCC)

4. *Vade Mecum* sections relevant to ITGS including internal assessment forms, updated yearly (available on the OCC)

5. *Vade Mecum* sections relevant to plagiarism, updated yearly (available on the OCC)

6. *Academic honesty: guidance for schools*, published September 2003 (available on the OCC)

7. Internal assessment feedback forms for portfolios and projects, sent to the school following each examination session (available from the school IB coordinator)

8. Subject reports, distributed after each examination session (available on the OCC)

9. *The extended essay guide*, published April 1998 (available on the OCC)

10. Subject report for the ITGS extended essay, distributed after each examination session (available on the OCC)

11. *Diploma Programme coordinator notes*, published quarterly (available on the OCC)

12. New subject developments and reports (available on the OCC)