

Meeting the professional development needs of online adult learners drawn  
from culturally and geographically diverse backgrounds

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## **Declaration of Originality**

This thesis does not contain material which has been accepted for any other degree in any university. To the best of my knowledge and belief, this thesis contains no material previously published or written by any other person, except where due reference is given in the text.

Signature: .....



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## **Abstract**

The International Baccalaureate (IB) is a worldwide education body. Computer Science, a subject offered in the pre-university Diploma Programme, has experienced declining enrolments and difficulty attracting qualified teachers. In 2006 the IB's online Professional Development (PD) section embarked on an online programme to augment standard face-to-face workshops. Computer Science was the pilot subject and the researcher, in conjunction with a colleague, developed and conducted a number of online courses between 2006 and 2009. This research focuses on the attitudes of teachers to the online environment, in particular considering whether differences based on cultural, gender or stated learning preferences were present. Additionally, the role of the online teacher in maintaining motivation to complete the course was investigated, and the characteristics of the online environment were assessed against good practice and the aims of the IB's online PD policy.

A small voluntary sample drawn from the overall course participants completed an online survey. The survey questions enabled a mix of quantitative and qualitative responses to be collected and analysed using a mixed methodology. Given the small sample size of 41 teachers, limited use was made of non-parametric statistics to compare responses controlled for gender, cultural group or learning preference. Frequency distributions were inspected to compare these sub-groups in relation to attitudes. Qualitative responses were coded to allow cross comparison between quantitative and qualitative responses.

The key findings were that for this specialist group there did not appear to be major differences in attitudes to the online environment based on gender, cultural grouping or stated learning preference. The assessment of the online environment indicated that it was flexible and met the majority of best practice principles, which enabled teachers with difference

experiences of and attitudes to online learning to successfully engage with the courses.

Additionally, the empathetic, flexible and encouraging nature of the online teachers was seen as an important characteristic of the online environment in terms of assisting teachers to manage the competing demands of the courses with their personal and professional time pressures, and hence maintain their motivation to successfully complete the PD.

## **Chapter 1 – Introduction**

### **1.1 Introduction**

This chapter outlines the purpose of the study, the research questions, provides background information on the International Baccalaureate (IB) organisation, the IB online professional development (PD) programme and the IB Computer Science online courses, outlines the overall structure of the thesis, discusses the significance of the study and finally considers potential limitations of the research.

### **1.2 Purpose and statement of the research questions**

The research aims to determine whether the online PD programme developed by the researcher and Mr Richard Jones the co-developer for the IB has met the needs of the teachers who have undertaken the PD between 2006 and February 2009. The PD programme was developed specifically for teachers of Computer Science within the IB. The research focuses on the characteristics of the teachers and the online environment to see if there are differences between groups of teachers in how they used or interacted with the courses. As teachers of Computer Science, the teacher group is characterised as adults who are highly qualified and experienced users of computer technology. However, the teachers come from culturally diverse backgrounds, are drawn from countries world-wide and have a range of different characteristics such as gender, learning preferences and experience of online learning. It is important to ensure that the PD programme meets the needs of the teachers and to investigate if there are differences, based on the characteristics of the teachers, in terms of how successfully they were able to interact and learn using the online environment. The outcomes of the research are aimed at informing and enhancing the professional practices of the Online PD department of the IB.

In summary, the broad aim is to determine the nature of the factors that contributed to the success of the online environment and to establish what relationships exist between the characteristics of participating adults and features of the online learning environment.

### **1.2.1 Research Questions**

There are two main specific areas of research and a third area which is concerned with an assessment of whether the online environment conformed to what the literature suggested was good practice.

The first area of research concentrates on investigating how teachers responded to the online learning environment, and in particular how gender, cultural background or stated learning style was related to the teachers' responses. In reviewing the literature there appeared to be a limited number of studies which considered fully online environments for delivering adult PD, and none with a similar culturally and geographically diverse teacher group as is considered in this study. The research looks to address this gap in the literature by providing information on how teachers in a fully online environment and from culturally and geographically diverse backgrounds respond to different aspects of it. There were studies which considered gender, culture and learning styles, but again none that did so for a fully online PD programme designed for teachers. Thus this research looks to address this gap and to provide important feedback to the IB to inform the future expansion of the online PD programme of which Computer Science formed the pilot programme. As an international education body it is extremely important that the IB has access to research which informs about gender and cultural factors as they make impact on online PD.

The second area of research contains questions that are related to the role of the online teacher. In reviewing the literature there was no specific study of the role of the online teacher in online PD programmes that incorporated such a culturally and geographically

diverse group of teachers. This research looks to provide information for the IB in respect to the important role the online teacher plays in, for example, assisting to maintain a teachers' motivation to complete the online PD.

**Research Area 1:** Response to the online learning environment?

**Research Question 1:** How did teachers respond to different aspects of the online learning environment?

In addressing research question 1 the aspects listed below were considered. These form the basis for the design of the survey instrument. Whilst each could be considered a separate research area it was determined for convenience to adopt numbering convention Q1.1, Q1.2 etc. for reference purposes rather than to have an extensive list of research questions. The justification for the design of the survey is undertaken in section 3.5 where each question is directly justified in relation to a specific research question.

Q1.1 Experience starting the course and using the LMS;

Q1.2 General issues of Motivational;

Q1.3 Comparison of face-to-face workshops with online;

Q1.4 Usefulness of forums;

Q1.5 Contact with other teachers;

Q1. 6 Impact on teaching;

Q1. 7 Course format & usefulness of course materials and time undertaken;

Q1.8 Attitude to the IB's proposed changes to Assessment.

**Research Question 2:** How did teachers from different cultural groupings respond to the online environment?

**Research Question 3:** How did female and male teachers respond to the online environment?

Both question 2 and 3 are considered in respect of each of the points listed under question 1 by filtering responses based on either gender and/or cultural grouping.

**Research Question 4:** How did teachers with different stated learning preferences respond to the online environment?

This question is further considered in terms of stated learning preference, gender and cultural grouping.

**Research Area 2:** Role of the online teacher.

These two questions are focused on considering the role of the online teacher. Research question 5 is a general question that addressed pedagogical strategies used by the online teacher to motivate, maintain interest and support learning. Research question 6 addresses the issue of the importance of the empathetic nature of the online teacher, this aspect is not well addressed in the literature and is seen by the researcher as an important gap in the research into the effectiveness of online adult PD.

**Research Question 5:** What role did the online teacher play in maintaining motivation, maintaining interest in the course and supporting the learning of the teachers?

**Research Question 6:** How important was the level of empathy shown by the online teacher?

## **Assessment of the online design**

Additionally, the researcher performed an assessment of the design of the online environment to see that it conformed to what would be considered good online PD design. The reason for doing this was two-fold. First to determine that the teachers had been presented with a set of soundly designed courses, and second that these conformed to what the IB had determined as good practice for the design of online PD. It should be noted that the IB policy in the area, which is explained further in section 1.3.3, was published after the IB Computer Science PD was developed. To perform this assessment a check list was developed based on what was determined from the literature review as good practice. The check list is shown on page 24 and the specific analysis is outlined in section 4.18.

## **1.3 Background**

This section provides background information about the International Baccalaureate, PD in the IB, the IB computer science subject and an outline of the online PD for computer science.

### **1.3.1 International Baccalaureate**

The International Baccalaureate is a not-for profit international educational organisation with an annual budget in excess of \$65million (US). It was founded in Switzerland in 1968 and has since expanded world-wide into 135 countries and is taught in 2633 schools. There are 718,000 students enrolled in the IB. The IB offer three programmes to students aged 3 to 18: Primary Years Programme (PYP), Middle Years Programme (MYP) and the pre-university Diploma Programme (DP) at the senior school level. The computer science program is offered as a subject in the DP. The DP is a two year diploma that seeks to prepare students for entry into university. Students complete a minimum of six subjects of which English and a second language are compulsory. Further details are provided in the next section.



The IB divides the world into three administrative regions: IBAEM encompasses Africa, Europe and the Middle East, IBAP encompasses Asia and the Pacific and IBA encompasses North, Central and South America. The details of the scope of the IB operations are shown in the two tables shown below. The first table 1.1: Schools by IB region, shows that the DP operates in a total of 1,580 schools, with the majority of schools located in either the North American or European regions. The second table 1.2 shows that 1001 of the total of 2633 IB schools are located in the USA.

	<b>Africa/ Europe/ Middle East</b>	<b>Asia-Pacific</b>	<b>Latin America</b>	<b>North America &amp; the Caribbean</b>	<b>Total schools</b>
PYP only	27	51	14	179	271
MYP only	12	37	5	292	346
DP only	540	179	178	683	1,580
All three	53	46	19	14	132
PYP+MYP	17	11	11	15	54
PYP+DP	24	30	15	8	77
MYP+DP	35	14	12	111	172
Total schools	708	368	254	1302	2,632

Table 1.1: Schools by IB Region (Source: <http://www.ibo.org/facts/fastfacts/index.cfm>)

<b>Country</b>	<b>Region</b>	<b>IB World Schools</b>	<b>Programmes</b>		
			<b>PYP</b>	<b>MYP</b>	<b>DP</b>
United States of America	NA	1,001	165	298	670
Canada	NA	284	46	131	132
United Kingdom	AEM	190	9	7	184
Australia	AP	120	44	48	57
Mexico	LA	69	30	21	47
India	AP	58	16	7	55
Argentina	LA	47	7	3	46
Spain	AEM	46	2	7	46
China	AP	43	11	15	38
Germany	AEM	38	14	7	35

Table 1.2 Top ten largest IB countries (Source <http://www.ibo.org/facts/fastfacts/index.cfm>)

The IB's curriculum and assessment is managed centrally from Cardiff, Wales, by the IBO Curriculum and Assessment Centre.

### 1.3.2 IB Diploma Programme Curriculum

The IB Diploma Programme (DP) curriculum is based on a hexagon model. Students select one subject from each section. In the middle are the three compulsory components the Theory of Knowledge subject, the individual research project called the Extended Essay and the creativity, action and service programme.

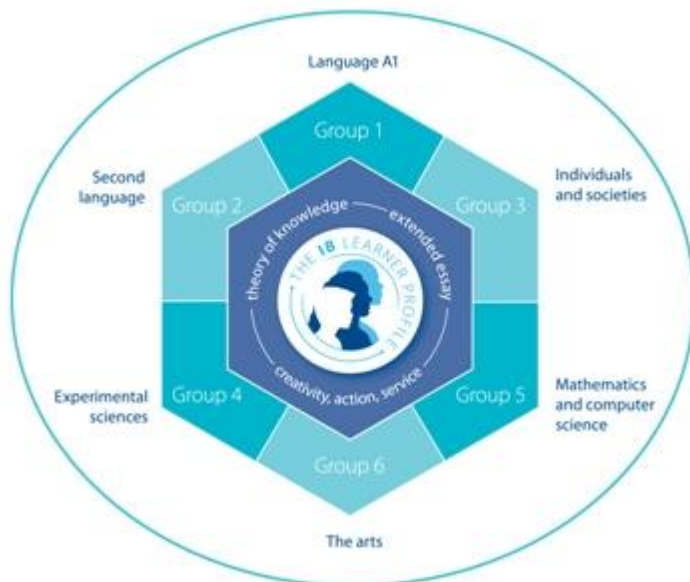


Figure 1.1 IB Curriculum Hexagon © International Baccalaureate Organization 2007. Source (<http://www.ibo.org/diploma/curriculum/>)

Students select one subject from each group. Computer Science is located in group 5 and is an elective. The IB DP seeks to expose students to both the humanities and the sciences, and ensures that students are bilingual by the compulsory study of a second language. Three subjects are studied at Higher Level (HL) and three at Standard Level (SL). The DP balances

breadth and depth of content and actively encourages the inclusion of citizenship and global perspectives in all subjects.

The fundamental aims of the IB are to provide a balanced education, promote international understanding and to facilitate the education of culturally diverse and mobile students. The DP is based on three fundamental principles:

- establish the broad discipline based knowledge and critical thinking necessary to pursue further study;
- foster international awareness; and
- provide flexibility of student choice within a sound framework.

Each subject has an internal school based assessment component that is externally moderated. Students sit two exams for each subject at the end of the two year period. There is an extensive network of IB teachers who participate in the moderation of the internal assessment and the marking of the exam papers. Teachers in the IB are therefore accustomed to working in small groups that involve cross cultural settings and geographical challenges. In recent times the use of technology in the form of a website has improved the marking and collation of exams and the moderation process of both the exam marking and the grading of the internal assessment in all subjects.

There has also been the development of the Online Curriculum Centre (OCC) which is designed to provide teacher level support on a worldwide basis. In essence it is developing into an online community. Teachers can access forums to ask clarify questions, participate in course reviews, contact other teachers and find out when PD is running. The OCC forums are moderated by experienced teachers.

Further details are available online at <http://www.ibo.org>.

### **1.3.3 IB Professional Development (PD)**

The IB operates an extensive professional development programme. This is administered centrally from within the Curriculum and Assessment Centre, with some regional offices, for example, in the USA also providing PD services. Until 2006 professional development was provided predominantly through face-to-face teacher workshops. These were held typically on an annual basis. An expert teacher or teachers facilitated the workshops and teachers enrolled and travelled, sometimes over large distances, to attend. Workshops would typically run over three days. The Northern and Southern hemisphere split caused timing problems for these sessions across all subject areas.

In January 2007 the IB published a policy document outlining the aims of online Professional Development (PD). It stated that 'we want to be able to facilitate communication between geographically dispersed and culturally diverse people, who share the IB experience as a common interest and who are able to learn collaboratively using networked, web-based technology' (IB Online PD Policy 2007 p. 3). The policy goes on to outline the rationale for design of the online PD. It stresses the importance of developing a community of practice and basing design on an understanding of current research and understanding of adult learning theory using an 'andragogical approach'. Key concepts here relate to promotion of active involvement of teachers in building knowledge that is directly related to their teaching practice. As an overarching aim the IB is looking for '...participants of our workshops need not only to be able to combine and share knowledge and expertise but also to foster a network of relationships based on trust and reciprocity'' (IB Online PD Policy 2007 p. 2). In conclusion, the policy document lists the following five design principles:

- (i) Develop the workshop community's ability to adapt – encourage participants to help shape the objectives and design of workshops;

- (ii) Link information to action – encourage learning by doing;
- (iii) Provide opportunities for coordinated action – utilise collaborative activities;
- (iv) Improve access to knowledge – enhance access to knowledge teachers need; and
- (v) Harvest knowledge in repositories – enable development of online knowledge resources.

This study focuses on the IB Computer Science online PD programmes to consider how these meet the needs of teachers who are drawn from culturally diverse backgrounds and geographically dispersed locations. The research questions are focused on how the needs of the teachers have been met. Additionally, in terms of the IB policy the study will provide information about if the workshop meet the needs of adult learners, promoted learning by doing (policy strategy (ii) above), utilised collaborative activities (policy strategy (iii) above) and enable teachers to access knowledge that was relevant to their teaching practice (policy strategy (iv) above).

#### **1.3.4 IB Computer Science**

The IB Computer Science DP course is offered at two levels: standard level (SL) and higher level (HL). Both courses are taught over a two year time table. The assessment of each is fundamentally the same. Students in each level complete a programming dossier worth 35% of the final mark. The programming dossier is a complex task requiring students to solve a problem by developing a Java program and writing accompanying documentation. Students also learn the theory of computer science and sit two exams at the completion of the second year.

The SL and HL courses share the first three topics which comprise the common core. The HL students then study the remaining topic areas.

The topics studied are as follows:

- Topic 1- Systems life cycles and software development
- Topic 2- Program construction in Java
- Topic 3- Computer system fundamentals
- Topic 4- Computer mathematics and logic
- Topic 5- Abstract data structures and algorithms
- Topic 6- Further system fundamentals
- Topic 7- File organisation (source: IB Computer Science Syllabus 2007)

Additionally students study a common case study from which further exam questions are set.

In recent years enrolments for Computer Science have declined, particularly at Higher Level.

From data gathered by Sarah Jones, Subject Area Manager, the main causes appear to be:

- Schools have difficulty recruiting teachers with the requisite skills
- The placement of Computer Science within the curriculum as an elective
- The subject is perceived as “difficult” by teachers and students

Enrolment data for computer science is shown in figure 1.1 below.

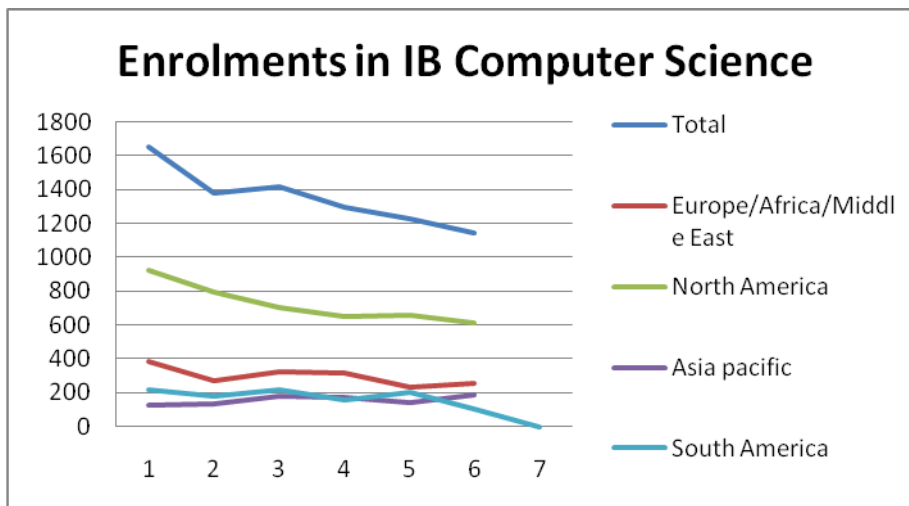


Figure 1.2 Enrolments in IB Computer Science 2004 to 2009 (Source: <http://www.ibo.org/facts/fastfacts/index.cfm>).

The data shows enrolments from 2004 to 2009. The trend over this time period has shown a decline of approximately 26%. The trend in Asia and Europe shows a slight recovery in numbers. This is reflected in a small increase in India and China and also in Eastern

European country enrolments. Enrolments in North America also declined, but show a levelling off. The region contributes approximately 50% of the total enrolment in computer science. The balance of male to female has been consistent of the time period at approximately 75% to 25%.

In summary, IB Computer Science is taught in all IB regions on a global scale. Students and teachers are drawn from both culturally diverse backgrounds and dispersed geographical locations. Further, this situation is characterised by declining enrolments and difficulty in attracting appropriately qualified teachers.

### **1.3.5 Online PD for Computer Science**

The online PD programme for computer science comprises three courses. For a detailed outline of these courses refer to appendix A1. Access is also possible via the following website: <http://www.ib-computing.net>.

The online workshop mirrors the standard face to face workshop. It covers introductory material, dossier marking, exam question setting and marking, the use of the case study and studies potential extended essay topics in computer science. The course runs for a period of five weeks.

The online ‘Java for the SL Dossier’ course addresses the computer programming theory required to teach students the skills they need to show mastery of specific programming constructs. The course is conducted over five weeks and culminates in a teacher designed assignment task that involves the teacher performing the first three sections of the Dossier. The Dossier is a structured report written by the student outlining the solution to a problem investigated and solved using the Java programming language. It contributes 35% of the overall mark awarded to students and is the only item of internal assessment.

The online 'Java for the HL Dossier' course has the same structure as the SL one but addresses the more advanced programming concepts required by students at the HL. The final assessment item is the same.

Each course was deployed using the Moodle Learning Management System (LMS) (for further information on the Moodle LMS refer to: <http://moodle.org/>). Teachers are enrolled via the IB Online Professional Development Department. Teachers were then provided with the login details and enrolment key for the appropriate course.

Each course is designed in the same way. The basic design is modular and is presented in a week by week manner. This meant that teachers were not able to see the following week until they had completed the current week. The predominant format was a reading, followed by exercises and then a weekly assignment. Teachers were encouraged to communicate with each other and all student exercises, queries and assignments were posted to public forums. A range of collaborative exercises and assignments were used. For example, in the workshop teachers worked collaboratively on both the exam and dossier marking exercises. There are few collaborative tasks in the Java courses.

#### **1.4 Significance – where the study fits**

The study is significant to the IB as it is the only research study that has addressed the online professional development programme. As outlined earlier, the IB's aim is to meet the needs of a culturally and geographically diverse teacher base. The research reviewed for this study suggested that there are likely to be differences between how different groups approach online learning. In this case the group being studied is characterised by being highly qualified and computer literate. Hence these two variables should not be features that limit teachers' access and effective use of the online environment. However the teacher group is drawn from



a range of cultures and countries, and so it was likely there would be a variety of experiences with online learning.

It was important to see if this group's reaction to the online environment was different to that of other groups who have less familiarity with computer technology and were possibly less well qualified. For example, the group of computer science teachers could be thought of as being independent and used to working with computer technology, and therefore less reliant on the online teacher. One of the research questions looks specifically at the role of the online teacher.

## **1.5 Organisation of the Thesis**

The thesis has been organised in the following way:

### **Chapter 1 – Introduction**

The main role of this chapter is to explain the context of the study. The chapter outlines the purpose of the study, states the research questions, provides background about the IB and the online PD courses, outlines the structure of the thesis and discusses the significance and limitations of the study.

### **Chapter 2 – Literature Review**

The purpose of this chapter is to review the relevant literature. The chapter considers literature in the following areas: adult learning & professional development, learning styles and preferences, impacts of culture, role of the online teacher, attitudes to different types of online learning activities and assessment, human computer interaction and gender.

### **Chapter 3 – Design of Methodology**

This chapter describes and justifies the methodological approach used for data collection and analysis. A rationale is presented for the mixed mode approach and the questions used in the online survey. The types of analysis are outlined, as is the method by which best practice criteria will be used to assess the learning environment.

### **Chapter 4 – Analysis**

This chapter provides details about the qualitative and quantitative analysis performed on the survey data collected from the sample of teachers. The purpose of this analysis was to provide information that is used in Chapter 5 where the research questions are answered. An analysis of the learning environment is undertaken using criteria developed by researcher. This analysis is also applied against the PD objectives of the IB and compared to the reactions of the teachers to the learning environment.

### **Chapter 5 – Results**

This chapter systematically summarises the results in relation to each research question.

### **Chapter 6 – Key findings, recommendations and future research**

The final chapter outlines the key findings related to each research question, outlines a series of recommendations intended for online developers and the IB online PD department, makes recommendations for future research and briefly outlines limitations of the study.

### **Appendices**

There are two appendices.

Appendix A1 is a detailed description of the online courses.

Appendix A2 is a list of the survey questions used in the online survey.

## **1.6 Limitations**

The study has a specific purpose that may tend to limit the degree to which the findings are relevant or generalisable to other online settings. There are three specific features of the study that may be seen as limitations: representative nature of the survey sample, single source of data and the role of the researcher in delivery of the PD.

### **1.6.1 Representativeness of the sample**

The sample of 41 teachers represents approximately 30% of the total number of teachers who have participated in the PD for the computer science subject. Whilst the sample is reasonably representative of the cultural and geographic background of computer science teachers, it could not be regarded as representative of the overall group of teachers who teach subjects across the IB.

### **1.6.2 Data Collection**

The data was collected using a single one off online survey made available via the Moodle LMS. No other sources of data were available other than the user logs from three courses. The user logs were considered a viable source of data to show how individual teachers interacted with the LMS, however, due to technical problems most logs could not be restored to provide a source of data. Consequently the study has been limited to one main source of data and three user logs. However the online survey enabled teachers to respond in a range of ways, and it is anticipated that the survey allowed sufficient scope to enable teachers to provide in depth feedback. The data collected is not restricted to one time period and provides a balance of input across each year that the PD has been conducted between 2006 and 2009. Other than considering the specific learning materials the data is considered as a single data set.

### **1.6.3 Researcher was the developer**

The researcher is also the developer and one of the two online teachers. As such there is potential for a biased interpretation of the data, especially in relation to the second research question which focuses on the role of the online teacher. The research methodology adopted is consistent with an action research model and the role of the researcher as a participant observer who is an integral part of the system under study. Whilst there is potential for bias or more importantly, non-reporting of negative findings, the professional and open nature of the research seeks to minimise and control this area.

### **1.7 Definitions and Clarification of terminology**

Terminology and acronyms within the study are outlined and explained in this section.

**Computer Science** – is abbreviated to CS and refers to the name of the subject the online courses belong to. Computer Science is the study of the theoretical foundations of the use of computer technology.

**Dossier** – this is the name given to the project undertaken by the Computer Science students. It is the only piece of work that is internally assessed (IA). The Dossier is worth 35% of the overall mark.

**Higher Level** – is abbreviated to HL and refers to the level at which the computer science course is taken by students.

**Internal Assessment** – is abbreviated to IA.

**International Baccalaureate** – is abbreviated to IB

**Java** – this is the name given to a computer programming language. Java is the only programming language taught and used in the IB Computer Science course.

**Learning Management System** – is abbreviated to LMS

**Learning Style or Learning Preference** – this refers to the notion that individuals have preferences with respect to the way they approach learning. The concept is outlined in the literature review in Chapter 2.

**Moderation** – this is the process by which marks from examiners and IA markers are checked to agree on a common mark scheme and standard during the examination period.

**Moodle** – an Open Source LMS used by the researcher to develop the online courses.

**Online course** – refers to the course written by the researcher and his associate made available to students via Moodle.

**Online learning** – online learning is taken to mean the use and access to learning materials via a website.

**Online teacher** – this term is used to refer to the two teachers that delivered the courses.

**Professional Development** – is abbreviated to PD

**Standard Level** – is abbreviated to SL and refers to standard level, the lesser of levels that students can study the computer science course at.

**Teacher** – this general term is used to refer to the teachers who took one of the courses.

**WebCt** – a specific example of an LMS

**Web Site** – this is a general term used to refer to a resource accessed via the Internet, in this case an online course.

**Workshop** – this term is used to refer to the online workshop course. It should not to be confused with the face-to-face workshop.

## **1.8 Conclusion**

This chapter has outlined the purpose of the study, the nature of the research questions, provided background to the study, discussed the significance of the study, outlined the overall structure of the thesis and outlined possible limitations. The study is a focused one and looks at how teachers who are drawn from diverse cultural and geographical backgrounds have responded to an online professional development for the computer science subject offered as part of the International Baccalaureate's Diploma. How the study fits into the literature and gaps in the literature are outlined in the concluding section of Chapter 2 – Literature Review.

## **Chapter 2 – Literature Review**

### **2.1 Introduction**

This chapter provides a review of the relevant research literature. The chapter is divided into the following sections, and included in each dot point is a rationale for its inclusion.

- Adult Learning Theory & Professional Development – this is included to provide a basis upon which to determine what would be considered sound design principles for online learning environments. It provides the basis for the assessment of the learning environments and to aid interpretation of certain research questions, for example, research question 8 which asks teacher about the pedagogical practices of the online teacher.
- Learning Styles and Preferences – this section provides the background to the research that has already been conducted in this area and is directly relevant to the research question 4.
- Impacts of Culture – this section provides the background to the research undertaken that relates to research question 2.
- Role of the online teacher – this section is directly related to research questions 5 to 8 and considers the importance of the role of the teacher.
- Student attitudes to different types of learning activities and assessment – one aspect of the way teachers respond to the online environment is likely to relate to the assessment instruments used. The IB is also particularly interested in this aspect in terms of gaining feedback from teachers about plans to require certain types of assessment in order to certify completion of a PD activity.
- Human Computer Interaction – issues related to familiarity to the use of computers and attitudes to computer interaction are likely to relate to how teachers respond to the online environment. In this study it is expected that the IB Computer Science teachers will have a high degree of familiarity with computing but not necessarily with online education environments. Teachers attitudes to the online environment from the usability point of view are addressed in research question 1.

- Gender – one of the factors investigated in the research is whether teachers responses differ in any respect based on gender, hence this aspect of the literature review relates to specifically to research question 3

## **2.2 Adult Learning Theory & Professional Development**

The purpose of this section of the literature review is to consider the research related to adult learning and specifically any research related to online professional development.

The term Andragogy is used specifically to refer to good teaching practice as it applies to adult learning, as distinct from the more general term Pedagogy. The IB uses the term Andragogy to stress that online workshops and courses need to reflect “current research into, and understanding of, adult learning” (IB Online PD Policy 2007). Knowles (1990) used the term when postulating his theory of adult learning. This theory asserts that adults’ learning needs are different because adults are more self-directed than typical university students. The key principles of his theory are:

- Adults need to be involved in the planning and evaluation of their learning. i.e. self direction;
- Learning activities for adults should be linked to and build on their experience;
- Adults learn best when dealing with things of specific interest to their jobs or personal life;
- Adult learning should be problem based and not content based; and
- Adult learners are motivated more from internal rather than external factors.

Cercone (2008) suggests that Knowles presents more a framework or idealised adult learner, by which we can construct an adult learning environment rather than a theory of how an adult learns. For example, it is not necessarily true that an adult learner sees themselves as self-reliant and not dependent on the teacher, and so could need assistance in moving to the more desirable state of self-direction. This aspect is discussed further in the learning styles review.

Cercone outlines her own extensive framework for creating a potentially effective online adult learning site which incorporates most of the other points made by authors reviewed



here, but adds the requirement to consider potential limitations possessed by an adult learner, e.g. experience of online environments.

Two additional theories have been used to characterise requirements for adult learning and are reviewed by Mason (2006). Kolb (as cited in Mason 2006) stresses the cyclic nature of experience and reflection, which leads to consolidation of knowledge and eventually the use of the knowledge. A limitation of this theory is how to guide critical reflection. Wenger (as cited in Mason 2006) stresses the importance of communities of practice as a place to conduct adult learning. This extends to the notion of a community of learners in an online course requiring activities that not only engage individuals, but also bring people to together. In a small study of an online professional development course for librarians at the University of Western Australia, Kiel and Pegrum (2007) reported considerable success in applying these principles to create an online environment to expand learners' experience of new technologies.

Mason (2006) named four key design aspects for online adult learning:

- flexibility regarding time and place;
- self-expression;
- choice of access to materials; and
- integration of learning with employment.

The aims of the IB are consistent with these models of adult learning and professional development models that take a constructivist and reflective approach (Phelps, Graham and Kerr 2004, Signer 2008, Vrasidas and Zembylas 2004), rather than a directive or training approach. More specifically Birman, Desimone, Porter and Garet (as cited in Signer 2008) state that the characteristics of good teacher PD builds on the experience of the teacher, provides teachers an opportunity to discuss, encourages ongoing discussion, and is related to standards.

The literature reviewed concentrates on research in Higher Education, as this is the most prominent form of research available and is likely to have a high level of transferability to the specific subject under study here, namely highly tertiary educated online learners.

Developments in Professional Development are considered in the next section of this literature review.

One aspect that links Andragogy and the two theories previously noted to what is considered good teaching practice, is the need to actively involve the learner. Active learner involvement is a key component of constructivist educational theory, which is generally considered to be a cornerstone of good online course design (Rivera and Rowland 2008, Signer 2008). Sims, Dobbs and Hand (2001) are somewhat critical of a range of material available on e-learning sites, stating that it is easy to produce confusing web pages that don't support learning, and Hasson (2005) is concerned that the content is what is important, not the form. O'Neil, Singh and O'Donoghue (2004) are also concerned about quality of written online materials, and state that there is a need to avoid 'cut and paste' from text sources to form the contents of web pages. According to Hannon and D'Netto (2007), whilst considerable effort has been put into development of online learning environments, there are still variable reactions from students irrespective of cultural factors. Weaver, Spratt and Nair (2008), reporting on developments at two Australian Universities, state '...due to a perceived lack of institutional support and adequate resourcing, many staff are forced to adopt teacher centred approaches in their online teaching' (p. 11). Such comments indicate that both the resourcing and teacher training are important.

Constructivist practice stresses the importance of student involvement, self direction and collaboration. Herrington, Oliver and Reeves (2002) list ten critical elements for effective online education, with a key element being to encourage students to be actively involved in constructing meaning. They also stress the importance of using pedagogies that use authentic

tasks and meaningful assessments, along with the need to create student centred environments. These elements are clearly consistent with Knowles' theory of adult learning. Maor (2004) and Oliver (2001) concur with the addition of the notion of the online teacher as a facilitator. Research reported by Quitadamo (2001) shows that teacher styles consistent with facilitation and delegation from teacher to student are the most successful in an online environment. The challenge is to present e-learning in a manner to support these aims. Maor (2004) recommends significant increases in research and time spent studying how to use technology to support the creation of e-learning environments which support a constructivist pedagogy. Alonso, Lopez, Manrique and Vines (2005) are critical of much of the web based e-learning materials, and propose an e-learning model that aims at providing personalised teaching that uses a blended approach with elements of self paced instruction, live e-learning and face to face teaching.

Achtemeir, Morris and Finnegan (2003) list the following criteria for assessing whether an e-learning system demonstrates good teaching practice and supports active learning:

- encourages direct student contact;
- encourages inter-student cooperation;
- encourages active learning;
- prompt feedback;
- high expectations; and
- respect for student diversity and ways of learning.

These criteria form a useful way for online teachers to evaluate their own e-learning systems.

In reviewing a number of evaluations Achtemeir et al. found that only a small number of teachers considered criteria consistent with providing an environment that encouraged student self-direction and active involvement.

Stodel (2006) recommended five additional features that should be included in an online environment to improve practice:

- enhance responsiveness to learners needs by encouraging the use of a more flexible design;
- coach learners how to learn online;
- increase effectiveness of social presence of the learner;
- articulate and manage the expectations of the online community; and
- understand all learners in the online community.

Returning specifically to online Professional Development, Signer (2008) in her review of best practices found the following to be required characteristics of effective online professional development:

- peer collaboration;
- reflective discussion;
- relevant and challenging assignments;
- highly organised and structured assessment that is clearly outlined at the beginning; and
- training on how to use the Learning Management System.

Interestingly, Signer (2008) reports that in a fully online teacher PD program that relied heavily on student input to reflective forums, participants reacted differently in satisfaction ratings depending on the level of feedback and questioning of a directive probing nature they received from the online teacher. Vrasidas and Zembylas (2004) confirmed that tasks should be authentic and linked to the context of the participant, promote self-reflection, provide regular feedback, developers need to constantly evaluate and revise and use a variety of assessment methods.

Panda (2004) outlined what he termed an online constructivist professional development model, and stated that in terms of building a community of practice linked to Professional Development it is important to foster critical reflection where the learning is constantly interacting with self and others. Research by Prince (2004) and Sahin (2007) (as cited in Glass and Sue 2008) showed that active learning strategies lead to both greater retention and increased course satisfaction.

In summary, this review of relevant literature indicates that the design of the online learning material needs to meet the following criteria:

- material presented is directly relevant to the professional needs of the teacher;
- training is available on how to use the online learning management system;
- material/structure facilitates active involvement rather than simply providing information;
- participant is able to direct their own learning and work at a pace and sequence that suits them;
- material/structure facilitates active discussion and collaboration with fellow participants;
- assessment items enable participants to develop critical understand by providing authentic and challenging items that are directly relevant to the needs of the teacher; and
- assessment items enable participants to be able to construct, question and reflect to enhance their own understanding.

The key issue that emerged from this review of literature was that online systems need to promote active learner engagement: online environments should not just present a static or passive environment. This is a key design issue. As mentioned earlier, the researcher used these criteria to perform an assessment of the online environments to ascertain that each conformed to sound design practice.

### **2.3 Learning Styles and Preferences**

One variable or characteristic of the participants in the online courses studied in this research was their stated preferred way to undertake learning and whether the online environment supported this preference. Over the past 30 years this notion of preferred ways to learn has been collectively described by the term Learning Style. There is considerable research that addresses learning style and preferences. For the purposes of this review only research that applied to adults was included, with preference being given to studies that involved computer or scientific curriculum. The cultural dimension was also considered in terms of whether there are any differences between cultural groups.

Concepts of learning style vary, and there is no one formally accepted theory of how children or adults learn in respect to their learning style. Also, each theory is based on a set of assumptions which is often not clearly understood by those that use the theories. Cox (2008) asserts that it is a contentious issue whether a person's learning style remains consistent over time and from context to context. It is unclear how differences in learning preferences, assuming these can be validly determined, should be addressed in terms of instructional design. Coffield, Moseley, Hall and Ecclestone (2004), in a report for the UK Government, stated that the conceptual notion of learning styles is complex with a range of somewhat conflicting theories, supported by a range of different theories of learning. This group determined that there were 13 major models of learning style, which were classified into a continuum of five sections based on the extent to which a particular theory asserted the fixed nature of a person's learning style. Theories in the first continuum hold that learning styles are predetermined by our genetic make-up and are not variable, whilst the other end of the continuum contains theories which draw on the learner, their experiences and learning environment. Meyer (2003), in respect of university students in the USA, suggested that students with certain learning styles could be more adaptable to e-learning, e.g. visual and independent learners, and students with high levels of motivation. Students who do not possess these characteristics, e.g. passive learners, might do less well. O'Neil et al. (2004) and Schrum and Hong (2002), state that students can be adversely affected by the shift away from the dependent learner style.

Before the relevant research is reviewed, several theories and the instruments used to assess learning styles within these theoretical frameworks are outlined. A number of the studies reviewed made use of these instruments.

Kolb (1984) was one of the first researchers and proponents of learning styles. He maintained that learning styles represent preferences that were not fixed traits but which can change over

time and from situation to situation (Joy & Kolb 2007). Kolb (1984) posits that there are essentially four learning styles. The most recent version of these styles are outlined in Coffield et al. (2004, p. 61):

- Type 1: converging style –abstract conceptualisation, active experimentation, good at problem solving and intelligence tests, emotionally controlled, preference for technical rather than interpersonal issues.
- Type 2: diverging style –concrete experiences, reflective observations, interested in people and feelings, imaginative.
- Type 3: assimilating style –abstract, reflective, likes theoretical models, likes ideas rather than concrete facts, less practical.
- Type 4: accommodating style –concrete, active, likes doing, good adapting, likes trial and error, good with people, can be seen as pushy.

For Kolb, learning involved ‘grasping and transformation of experience’ (Kolb 1984, p. 41).

Kolb’s theoretical approach was based on experiential learning theory (e.g. Piaget and Dewey). As learners cycle through the four stages their learning style is derived by assessing the degree to which the learner shows a preference for some stages over others. For Kolb, how a learner approaches learning is derived from the dynamic interaction of our genetic qualities and environment (Joy et al. 2007, p. 8). The test used to determine a person’s learning style using Kolb’s theory is known as the Kolb Learning Style Inventory (KLSI) or simply the LSI (Kolb 2005, as cited in Joy et al. 2007).

An easy to administer version of the LSI has been devised by Solomon and Felder (2009).

This survey instrument is used in several of the research studies reviewed. It is freely available via the Internet (<http://www.engr.ncsu.edu/learningstyles/ilsweb.html>). As it is derived from Kolb, the fundamental premise is that the learning styles being measured are not that of an unchangeable trait, and they relate to our experiences.

The Solomon-Felder LSI uses the following four continua:

- Active to Reflective –active must be involved, reflective needs to time to think and process.

- Sequential to Global –sequential needs material in linear steps, global needs the big picture and can link across different areas.
- Sensing to Intuitive –sensing likes facts, proven methods, intuitive likes discovering, can be careless
- Visual to Verbal –visual learns best from what they see, verbal learn best from written or spoken presentations.

Kolb's LSI and the variant LSI from Solomon and Felder fit into the fourth continuum defined by Coffield et al. (2004), that is, that the trait is not fixed.

The final learning style instrument considered here is the Grasha-Riechmann Student Learning Styles Scales (GRSLSS). This is grouped in the last continuum of Coffield et al. (2004). Grasha and Riechmann's theory originated in 1974 from a small study conducted by Riechmann on her students, and places emphasis on how the learner values interaction with their peers, teacher and the environment. Six learning styles are identified across three continua (Grasha and Riechmann 1995):

- Independent to Dependent – independent like to work alone, little need for direction, dependent learners need teacher direction and can get frustrated with new situations.
- Competitive to Collaborative – competitive see classmates as in a race to be beaten, collaborative like to work in groups.
- Avoidant to Participant – participant style emphasis is on self direction, responsibility for own learning, whereas avoiders tend to lack self-discipline and motivation.

The GRSLSS does not hold that learning styles are fixed.

From this very brief review it can be seen that the choice of learning styles instrument does imply an implicit acceptance of a theory of learning, and that making comparisons between theories and instruments is both difficult and beyond the scope of the present study.

In an early study by Diaz and Cartnal (1999) traditional and distant education classes in Health Education in the USA were compared using the GRSLSS scale. The distance education students showed a preference for the Independent style where as the face-to-face students showed a preference for a collaborative approach. The independent style groups also



correlated negatively to the collaborative and dependent styles, whereas the collaborative style group correlated positively to the dependent and participatory styles. Interestingly, the independent learners in the distance classes would be prepared to collaborate, but only if the collaborative exercises were structured by the teacher. These students did not like to initiate peer contact. Yang (2008) some 10 years later used the GRSLSS to correlate Taiwanese students' perception of the quality of an e-learning environment at the National Tsing-Hua University. A positive relation was found for learners with an independent style, but also for students with participatory and collaborative style.

Lu, Yu and Liu (2003), using a field independence based learning styles instrument called GEFT, which Coffield et al. (2004) did not group with the experience based theories, found that learning style and other demographic features were not related to achievement on a WebCT based Master of Information Systems (MIS) course offered in the US. Additionally, she considers the patterns of learning, i.e. how the students accessed and used the different components of the WebCT course, and found differences in patterns of use but not in achievement. Other research has also highlighted that differences in learning preferences did not affect achievement (Aragon, Johnson & Shaik 2000 cited in Sheard and Lynch 2003, Neuhauser 2002, Brittan-Powell, Legum and Taylor 2008). It was concluded by Lu et al. (2003) that whilst there was a low level of cultural or ethnic differences, these were probably explained by lack of familiarity with some aspects of technology in the early 2000s rather than any specific cultural practice or factor. Each of these researchers used different learning style assessment instruments, yet the results consistently found little difference in achievement in online courses attributable to differences in learning styles.

In a study that has direct relevance to the research undertaken in this project, despite not being an online environment, Zualkerman, Allert and Qadah (2006) compared the learning styles of Middle Eastern students at the American University of Sharjah (AUS) and American

students at the University of Minnesota (UMD) enrolled to study computer science and engineering. The LSI inventory was used to determine the dominant learning style of both groups of students. The clear outcome of this research was that the distribution of learning styles is remarkably similar across the two cultural groups. Additionally, correlations between different styles and university success showed that students with a reflective style tended to do better, which Zualkerman stated was consistent with research by Allert (2004) (as cited in Zualkerman et al.). Zualkerman also considered a mismatch between instructor and students' style and whilst there were differences between UMD and AUS instructors preference, there was no correlation between performance and instructor preference.

In contrast to Zualkerman, Joy et al. (2007) found cultural differences did exist in a study of culturally based data made available from the company that sells the Kolb LSI. Joy et al. (2007) also reported on previous studies that used the Kolb LSI and found cultural differences. Joy et al. (2007) asserted that subject areas such as computer science may promote an abstract analytic style that overrides cultural differences. However, Joy et al. (2007) were not specifically looking at online environments nor considering if the differences translated into either different perceptions or levels of achievement. This study, and the framework that was used to classify cultural characteristics, is reviewed further in the next section on cultural issues

The research on learning styles clearly presents the problem of comparison between studies, as each tends to use different instruments to assess learning styles. However, it does appear that differences in learning styles might not be as great a problem as first thought. In terms of the current research study, the participants were asked to indicate their preferred way to learn and whether the online environment provided opportunities to learn in the preferred way. This data was categorised as part of the process of data analysis.

## 2.4 Impacts of Culture

A useful definition of culture was derived from the work by House, Hanhes, Javidan, Dorfman and Gupta (2004) (as cited in Joy et al. 2007) who conducted a major cross cultural study of cultural difference referred to as the Global Leadership and Organizational Effectiveness (GLOBE) study. House et al. (2004) suggested that culture can be conceptualised as ‘shared motives, values, beliefs, identities, and interpretations or meanings of significant events that result from common experiences of members of collectives that are transmitted across generations’ (House et al. 2004, cited in Joy 2009, p. 70). On the surface it does not appear unreasonable to assume that the differences that exist between cultures might impact the way people from different cultures approach the use of online learning environments.

One aspect which is important to the IB is that of catering for the diverse backgrounds of teachers. In the key document outlining the policy related to the development and deployment of online PD workshops it is stated that a major aim of the online PD program is to “facilitate communication between geographically dispersed and culturally diverse people” (IB Online PD Policy 2007 p. 3). One of the characteristics of teachers considered in the study reported here is the cultural background of the teacher.

Given the definition of culture and the IB’s aim, it is important to consider if people’s different values, beliefs and practices do impact on their approach to online learning environments. This section of the literature review focuses on Hofstede’s (1997) theory of cultural difference and also on specific examples of studies into the impact of a participant’s culture on their reactions to an online learning environment, particularly in the case of adults. Importantly, the cultural classification system used in the GLOBE study referred to in the previous section, which were derived from the work of Hofstede (1997), is also outlined.

Research that is not just related to the professional development area, for example from higher education, is considered, although research related to students in schools is not considered. No particular time frame was used. Research connecting culture and learning styles is considered in the next section of the literature review.

The five aspects of culture identified by Hofstede (1997), which he terms cultural dimensions, are: power-distance, collectivism vs. individualism, femininity vs. masculinity, uncertainty avoidance and long-term vs. short term time orientation. Each of these is briefly outlined below:

- power-distance: extent to which less powerful in a society accept inequalities;
- collectivism vs. individualism: individualism refers to societies that stress the importance of individual achievement, where as those classified as collectivist stress the importance of a cohesive group;
- femininity vs. masculinity: masculine societies tend to have very clearly defined gender roles, whereas gender roles in feminine societies overlap;
- uncertainty avoidance: level of unease experienced when confronted with uncertain situations. High uncertainty avoidance societies tend to be highly structured and intolerant whereas low uncertainty societies tend to be less structured and more tolerant and
- long term vs. short term time orientation.

These dimensions figure prominently in a number of studies. Tylee (2001) reviewed these dimensions and raised some interesting questions about how people from different cultural backgrounds might perceive an online learning environment. For example, should learning place an emphasis on individual or group work? Toland, Frank and Schenk (2005) also saw the dimensions as having the potential to provide a theoretical framework, but warns that the

dimensions tend to provide a static view of culture. Bauer, Chin and Chang (2000) also used these theoretical dimensions to relate cultural background to usage patterns and attitudes of students to a web based learning subject in a business subject within the Business School of Curtin University in Western Australia. There were 52 students classified as Anglo-Saxon and 105 classified as Asian. The findings concluded that both groups found the online course satisfactory and that the Asian students did feel more able to contribute to online discussions and forums than in face-to-face tutorials. However, the Anglo-Saxon students recorded far more web accesses and had less difficulty navigating the online site. Bauer et al. concluded that this provided some evidence to suggest that Anglo-Saxon students were more accustomed to student centred activities. Interestingly, a high number of Asian students were attracted to the online course because it was innovative, leading the researchers to suggest this contradicted Hofstede's (1997) notions of collectivist societies valuing traditional approaches, and hence likely to be more resistant to change. Toland et al. (2005) reviewed research conducted during the early 2000s on the use of distance education by students attending University of the South Pacific (USP) and at the Central Queensland University (CQU), finding that there was a difference in how students from Fiji and Australia used online facilities such as email. Toland et al. (2005) concludes that there is evidence from the studies to confirm some aspects of Hofstede's (1997) dimensions, namely students from Fiji, characterised as a collectivist high power society, tended to use email to interact with peers rather than their teachers. Questions tended to be of a clarification nature rather than volunteered answers that could be shared. This contrasted with students from Australia, characterised as an individualistic low power society, who tended to both seek clarification but also to volunteer answers on a much more regular basis. Toland et al. (2005) suggested that anxiety over "loss of face" may have prevented the students from a collectivist high power society from publicly being seen to answer incorrectly.

Differences consistent with Hofstede's (1997) dimensions were found by Lim (2004) in a study of American and Korean online learners in undergraduate and graduate courses in both countries during 2001-2002. He studied what motivated the students, and concluded that there were differences attributable to cultural differences. For example, American students liked being able to voice opinion and concern, whereas Korean students valued these aspects less and were reluctant to be active and preferred to be passive. However both groups, not surprisingly, were more motivated if the courses were seen to be relevant. Further studies by Zhu, Valcke and Schellens (2009), Devlin (2006), Shanahan (2008), Goold, Craig and Coldwell (2007) and Hannon and D'Netto (2007) consistently point to cultural differences being present in the way students use online learning systems. The predominant issue raised is that students from high power societies may have difficulty adapting to the requirements for learners to utilize the more self directed and constructivist approaches that are usually embedded into online environments. However not all studies show this, and it is not necessarily the case that all students from one group will behave in the same way or will not change following exposure to different modes of instruction. Fang (2007), reporting on a study of 25 full-time engineering students at a Singapore University, found that whilst students enjoyed the e-learning experience there was some reluctance to use public forums, with students showing a preference for the use of private MSN chats. Fang also suggests that the notion of cyber-culture needs to be reconsidered. Cyber-culture (Negroponte 1995, Prensky 2001) is said to transcend ethnic, national and regional boundaries. Hofstede's (1997) dimensions maybe far too general and not take into account differences that might exist within cultural groupings, and importantly may not take into account differences in education level.

An important study of cultural difference referred to earlier as the GLOBE study refined Hofstede's classification system to include ten cultural groups as shown in Table 2.1 below

(Gupta V, Hanges, PJ and Dorfman, P, 2002, p. 31). Gupta et al. (2002), who was part of the study, discussed the reliability of the classification system at length, concluding that the “GLOBE cluster classifications are reliable indicators of world-wide cultural attributes” (2002 p. 15). The study by Joy et al. (2007) referred to in the previous section also used this cultural classification system and has been adopted by the researcher to classify the cultural background of the teachers in the study by using the teachers place of birth.

<b>1. Anglo</b>	<b>2. Latin Europe</b>	<b>3. Nordic Europe</b>	<b>4. Germanic Europe</b>	<b>5. Eastern Europe</b>
Australia, Canada England, Iceland New Zealand South Africa United States	France Israel Italy Spain Switzerland (French)	Denmark Finland Sweden	Austria Germany Switzerland Netherlands	Albania Georgia Greece Hungary Poland Slovenia
<b>6. Latin America</b>	<b>7. Sub-Saharan Africa</b>	<b>8. Middle East</b>	<b>9. Southern Asia</b>	<b>10. Confucian Asia</b>
Argentina, Bolivia Brazil, Chile Colombia, Costa Rica, Ecuador El Salvador, Guatemala, Mexico	Namibia Nigeria South Africa Zambia Zimbabwe	Egypt Kuwait Morocco Qatar Turkey	India Indonesia Iran Malaysia Philippines Thailand	China Hong Kong Japan Singapore South Korea Taiwan

Table 2.1 GLOBE Society Clusters

The GLOBE study involved the analysis of 17,000 surveys. The survey used a seven point Likert scale, low attribute (1) to very high attribute (7), and a series of qualitative questions to gauge attitudes related to nine cultural indicators. The study began in 1994, involved middle managers from 951 organisations across sixty two culturally diverse countries. The study was interested in cultural differences particularly from a business perspective, and as such is not directly parallel to education. The GLOBE study used the following nine cultural indicators to categorise cultural practices and then considered the degree to which each cultural grouping conformed to these practices. The nine indicators or dimensions are:

1. Performance orientation – rewarding performance improvement
2. Uncertainty avoidance – rely on established social norms and bureaucratic processes
3. Future orientation – focused on future goals, delay immediate gain
4. Humane orientation – level of openness e.g. friendliness
5. Institutional collectivism – value collective distribution and collective action
6. In-group collectivism – level of attachment to group
7. Gender egalitarianism – degree of gender equality in role and position
8. Assertiveness – level of open aggression shown
9. Power distance – degree to which less powerful accept inequality

It is beyond the scope of this review to give other than a brief summary of the findings. The overall finding was that differences existed between what was termed the Meta-Western region: 1, 2, 3, 4 and 5 as shown in Table 2.1, and the meta-Eastern region 6, 7, 8, 9 and 10 (Gupta et al. 2002). A convenient way to see how different countries rated on some of these dimensions is provided in a table – see Table 2.2 below - compiled by Joy et al. (2007) in the study referred to earlier, that looked at whether there were differences in learning preferences using the GLOBE data. The table shows GLOBE cultural dimensions 2, 3, 1, 6 and 5 across the top row and the mean country score on the Abstract Conceptualization (AC) vs. Concrete Experience (CE) rating from the Kolb Learning Style Inventory (KLSI). The mean was derived from data collected from the company that distributes the KLSI worldwide. The sample comprised 1292 respondents from 8 of the 10 clusters. Only Sub-Saharan Africa and the Middle East were not included.

Country	AC-CE	Uncertainty Avoidance	Future Orientation	Performance Orientation	In-Group Collectivism	Institutional Collectivism
Italy (2)	4.93	3	3	3	2	3
Brazil (6)	5.41	3	2	2	2	3
Poland (2)	6.43	3	4	2	1	2
USA (1)	6.57	2	2	1	3	2
India (9)	7.63	2	2	2	1	2
Germany (3)	8.03	1	2	2	3	3
Singapore (10)	11.07	1	1	1	1	1

Table 2.2 AC-AE scores and the selected dimensions from the GLOBE study  
Source: Joy et al. (2007), p. 31.

Rather than attempt statistical inference methods Joy et al. (2007) uses what is termed a more: “..inductive process to investigate the dimensions of culture that potentially could affect learning styles by identifying the relationship between the AC-CE scales and the relative positioning on select cultural dimensions” (Joy et al. 2007, p. 30).



The key observation is that reliance on abstract conceptualisation seems to increase as the degree to which the cultural dimension shown strengthens. Observing, for example that members of societies that tolerate a high level of ambiguity may favour a more concrete experimental style of learning, i.e. happy to try new things. Their overall conclusion is that there is evidence for cultural impacts on the preference to learn using abstract thinking as a starting point rather than concrete experience. Culture accounted for 22% of the difference between clusters and 28% within countries in a cluster. The more important finding was the educational level or specialisation accounted for 28% of the difference between clusters and 32% within clusters.

In respect of a preference for active experimentation as compared to reflective observation (AE-RO) the impact of culture is less pronounced. A similar table to the one above is shown below in Table 2.3.

Country	AE-RO	Uncertainty Avoidance	Future Orientation	Performance Orientation	In-Group Collectivism	Institutional Collectivism
Germany (3)	4.43	1	2	2	3	3
Singapore (10)	5.45	1	1	1	1	1
USA (1)	5.47	2	2	1	3	2
Brazil (6)	7.00	3	2	2	2	3
Italy (2)	8.00	3	3	3	2	3
India (9)	8.12	2	2	2	1	2
Poland(2)	9.50	3	4	2	1	2

Table 2.3 AE-RO scores and the select dimensions from the GLOBE study  
Source Joy et al. (2007), p. 35.

The main observation is that:

“It appears that with the increase in uncertainty avoidance, the propensity for reflection goes up. Countries that are high on in-group collectivism appear to be more action oriented than others, contrary to common belief” (Joy et al. 2007, p.34).

This research on culture and learning styles tends to suggest that at least with the learning styles assessed using the KLSI test there appear to be the potential for cultural differences to impact on how teachers may prefer to learn. Of specific interest to this research project is cultural difference within professional development of highly qualified individuals drawn from different backgrounds. The group of people participating in the IB online workshops, whilst drawn from a range of countries, are experienced computer users and are well educated. In reviewing the literature there appears to be less research that specifically addresses whether cultural differences are likely to exist within such a group in relation to fully online environments.

The previous sections of the literature review have concentrated on three specific areas: culture, learning styles, and what are considered good practices in terms of adult education and online professional development. The purpose of the next section is to review what research says generally about the role of the online teacher or facilitator, student attitudes to different forms of learning activities and assessment, human computer interaction, and the impact of gender on attitudes to online environments.

## **2.5 Role of the online teacher**

The role of the online teacher or facilitator is one of the research questions addressed by this research. In the section on adult learning and learning styles researchers, including Diaz et al. (1999) and Signer (2008), indicated that in terms of facilitating online discussion and interaction the role of the teacher was important. In other words interaction did not just

happen. Santovec (2004) (as cited in Stanford-Bowers 2008) asserts that persistence is higher in students who feel they are part of a group or learning community. The drop-out rate in the Computer Science professional development studied in this research has been reasonably low, less than 10%. Potentially, this is in part related to the way the two online teachers established and fostered relationships with the teachers undertaking the PD. Stanford-Bowers (2008, p. 38) indicated that it is important for online teachers to be 'aware that their students are adult learners who bring with them a number of other issues requiring their time and attention'. Teacher support and feedback is reported as a key factor in increasing student satisfaction by many studies (Cuthrell and Lyon 2007, Sun, Tsai, Finger, Chen and Yeh 2008, Grant and Thorton 2007). These findings were also confirmed by Tallent-Runnels, Thomas, Lan, Cooper, Adhern, Shaw and Liu (2006) who conducted a meta-analysis of literature related to online education in the USA and concluded that following strategies had proved to be effective:

- establishment of effective communications,
- timely feedback made by the online teacher,
- encouragement of social interaction and
- employing collaborative active learning strategies.

Another issue that active teacher involvement can help overcome is that of the feelings of isolation an online learner can feel. Stanford-Bowers (2008) indicates that this is a potential problem for a number of adult learners, and clearly is a potential issue for teachers participating in the IB Computer Science online courses.

One issue to emerge is that it is a mistake to assume that the human aspect of education is somehow lessened in online environments. The teacher still has a central role to play in much the same way as with traditional education settings. As Savery (2005) suggests, 'compassion' is an essential quality for online teachers. This is an aspect of the role of the teacher is taken up in this research project.

Paloff and Pratt (2003) (as cited in Stanford-Bowers 2008) suggest that teachers should set minimum levels of participation and postings levels as part of assessment. The IB are also interested in whether assessment of these issues should be considered before certifying completion, along with the potential use of some form of summative assessment. A draft set of criteria have been circulated by the IB, and these will be considered as part of the research. The type of assessment is a characteristic of an online PD environment and effective assessment of online professional development is a major issue.

## **2.6 Student attitudes to different types of learning activities and assessment**

The literature reviewed in the previous sections asserted that active student involvement is considered a desirable pedagogical feature to have designed into online education environments. A number of studies confirm this as a preference of successful students (Ellis and Cohen 2005 as cited in Glass et al. 2008, Sahin 2007 as cited in Cuthrell and Lyons 2007). Balancing this are studies which show that active involvement does not suit all learners, or indeed all learning styles. Glass reports two studies (Cuthrell and Lyons 2007, Dinnan 2008) that found students preferred a balance between active and passive activities and often a number of students only participated in online discussion to meet course requirements. Dinnan (2008) used the term ‘lurking’ to describe the behaviour of students who do not contribute and simply read forum postings, but still complete the online course requirements. In terms of learning style, it is not unreasonable to speculate that certain individuals would not find contributing to discussion useful, in fact may find it stressful. The issue also arises in a cultural context where class members might not be comfortable contributing, although research reviewed in the section on cultural issues suggested that students from certain cultures might feel more comfortable contributing in an online environment rather than in a face-to-face classroom.

## **2.7 Human computer interaction**

The literature indicates that a person's positive or negative attitude, referred to as self-efficacy in the literature, towards technology in general and the Internet in particular, are related to attitudes to online learning environments (Sun et.al 2008, Wang and Newlin (2002) as cited in Sun et al., Thompson, Meriac and Cope (2002) as cited in Sun et al., Tallent-Runnels et al. (2006)). Difficulties with access to appropriate technology and the ease of use of the Learning Management System are also factors that can contribute to negative assessment of online environments (Cuthrell and Lyon 2007, Meiselwitz and Sadera 2008, Hannon et al. 2007). Kao and Tsai (2009) found that teachers' attitudes in Taiwan to web based technology is directly related to the level of usefulness they ascribe to the professional development and the levels of anxiety expressed by teachers towards the use of computer technology, which they indicate is mostly due to the teachers lack of experience with the use of computers. It should be noted that these were not IB teachers and nor did they participate in the IB professional development programme for computer science teachers.

This is an important issue for the IB in terms of the general use of online PD across all subjects areas. The IB computer science teachers will be asked to comment on their interactions with the online environment.

## **2.8 Gender**

Ensuring that participants in the online environments used to provide online professional development for IB teachers are not discriminatory in terms of gender is an important issue for the IB. The survey data collected will be analysed by gender, cultural background and stated preferred learning style to see if there are differences. The differences related to gender will be compared to the available research however the female participants in the sample are

well qualified and experienced teachers, which needs to be borne in mind making direct comparisons.

Research on gender issues in online education has tended to focus on attitudes, reasons for use of certain online features and achievement. A number of studies addressed gender when considering culture and/or learning styles as variables. These have been referred to in the earlier review of the literature on culture and learning style. The study by Bauer et al. (2000) found that gender was not a significance factor in terms of perceptions of web based learning, patterns of usage and perception of discussion groups. This pattern is confirmed by Fang (2007) and Zualkerman et al. (2006), whilst acknowledging small differences in attitudes to the web based learning based on gender existed these were in both instances most likely the result of prior access to technology, which might have resulted in female students experiencing some initial problems using the online system, but these problems were generally quickly overcome. Based on gender, Zualkerman found no significance difference in the distribution of learning styles. The 2005 study by Joy and Kolb (2005) found culture explained 22% of the differences between learning styles across cultures as compared to 17% by gender, but academic specialisation accounted for 39% of differences found. The study did not look at achievement, so we do not know if the differences translate to differences in perceptions of the online experience or attainment. Lu et al. (2003) found that there were no statistically significant differences in achievement when controlling for differences in learning styles, gender, experience of technology or prior online learning experience. Likewise, Hannon et al. (2007) found no differences in satisfaction levels based on gender. Studies by Gunawardena and Karunanayake (2008) from the Open University of Sri Lanka and Dabaj and Basak (2008) from the Sakarya University in Turkey both reported that women in their studies adapted well to online environments and often have more positive attitudes than their male counterparts. On the other hand, a range of researchers report

differences based on gender. Li (2005) outlined the possibility of differences in how men and women communicate online. Meyers, Bennett and Lysaght (2004) in a study of mature aged women enrolled in online learning at an Australian University found some evidence to confirm Li's suggestion that differences in online communication could inhibit women's enjoyment and rate of success, especially in initial exposure to online environments which are not moderated.

## **2.9 Summary**

The review of literature indicates that the aims of the IB's online PD programme are consistent with what are considered good practice in terms of online education aimed at adults.

The characteristics of adult learners considered in this study include: gender, cultural background, learning preference and experience with online environments. The research tends to suggest that whilst some studies have found differences based on these characteristics others have not, in particular, where groups were involved in computer related studies. However, the studies tend to have not considered fully online environments where participants have been drawn from diverse cultural and geographic backgrounds. The role of the teacher has also not been significantly researched in such online environments. This study seeks to address this lack of specific research.

## **Chapter 3 – Methodology**

### **3.1 Introduction**

The source of the data collected in this study is the teachers who have enrolled in one of the IB online Computer Science PD courses. These teachers are spread throughout the world. The dispersed nature of the teacher population placed a limitation on the data collection phase which has shaped the methodology. Given the dispersed nature of the population, it was decided that only one phase of data collection would be attempted. This constraint also limited the possibility of administering a separate assessment of learning styles using, for example, the online Solomon-Felder test. The original design was to use a selected follow up approach of specific teachers, based on their initial responses to an online survey. However it was decided to not pursue this latter option because of the time involved and the desire not to overly burden already busy teachers.

Given that only one data collection instrument could be used, a mixed methodological approach was adopted. The key advantage of this approach was the fact that qualitative and quantitative responses could be collected at the same time. As outlined below in the justification of the questions used, an attempt was made to design a balanced cross verification approach where a qualitative response was balanced by providing the capacity for the teacher to explain and expand by providing a detailed qualitative response. Such an approach is consistent with what can be defined as a concurrent triangulation strategy (Cresswell 2003). This approach is recommended when a limited time period is available for data collection. The use of quantitative and qualitative responses aims to add a level of cross verification or corroboration of responses, and also allows for more consistent interpretation of the data. In this sense the method seeks to balance the weaknesses of a single method.



However, as Creswell (2003) asserts, it can also be difficult to interpret differences and there is not the opportunity to gain additional information once the survey has been completed.

The study aimed to understand how teachers have reacted to specific aspects of the online environment, for example what they found useful, how they felt, what impacted on their motivational levels, and how they perceived the importance of the level of empathy shown by the online teacher. As such, the design has sought to give voice to the teachers rather than simply collate a series of responses to pre-determined questions. This is consistent with a range of educational research methodologists who argue that in order to gain an in depth understanding of experiences it is important to provide a way for the subjects under study to respond in an unstructured manner (Ticehurst and Veal 2000, Creswell 2003, Patton 2002, Bryman and Bell 2003).

### **3.2 Variables under consideration**

The two key category variables used are gender and culture. Culture is inferred from the response to country of birth and also from the location of the university at which the teacher gained their qualifications. To enable comparisons to previous cross-cultural studies of attitudes to learning and learning styles the cultural groupings used by the GLOBE (Gupta et al. 2002) study have been used to categorise a teachers' cultural group. The GLOBE study was outlined in Chapter 2 in the literature review. However caution needs to be exercised when classifying an individual according to group characteristics, as variations within groups can be as significant as variations between groups, and there is also the problem of use of cultural stereotypes and, as found by Joy et al. (2007), a person's educational background can have an impact on their learning preferences.

The research design also sought to determine a teacher's stated learning preference, attitude to online learning, perception of the role and practices followed by the online teacher. Each of these can be represented again as a category variable.

These variables enabled the data to be analysed with respect to each research question. For example, the stated learning preference can be classified according to gender and culture, and then compared between the different groups to see if there are indications of differences.

### **3.3 Mixed methodologies**

Quantitative approaches to education research seek to describe phenomena by use of statistical measures, frequency tables, graphs and the like. Typically a null hypothesis asserting that there is no difference between the groups is constructed, tested and considered within the bounds of a range of statistical tests to determine the likelihood that any differences are due to chance or possibly derived from specific differences between groups under consideration. The aim is to provide objective information that is both valid and reliable. Many statistical tests are dependent on the underlying distribution of the responses, for example a normal distribution is assumed in a range of parametric tests.

The data collected in this study is from a small sample which is itself neither normally distributed nor likely to have been derived from a normally distributed population.

Consequently the use of parametric testing of differences between groups based on variables such as gender or culture would not produce statistically valid measures. However non-parametric testing such as Fisher Exact Tests or, provided the distributions allow, Chi-Square tests, can be used to assess potential difference to questions relating to attitudes of difference groups based on gender and culture. However these statistics, are based on small sample sizes and needed to be interpreted with caution. There was also the problem of whether the sample is random and if independence is satisfied. Category counts rated against male and female

ensure that data is independent, in other words a person can't be double countered. The sample is voluntary and hence not drawn randomly. However, the basic distribution of the sample is similar to the population, and given that we know from past teacher evaluations provided to the IB that there has been a high level of satisfaction with the PD, it is likely that the sample is not overly biased in favour of teachers who had only positive responses. Nevertheless, the results of the statistical testing are treated with due caution.

The most common quantitative measure used is the frequency distribution, represented using either counts or percentages and presented as tables. Contingency tables are also used to allow comparison of the proportions. Controlling for variables such as gender and culture allowed comparison of frequency distributions on questions such as attitudes to the online learning or differences between expressed learning style preferences.

Qualitative approaches seek to enable the researcher to explore in more depth the reasons why individuals or groups react in certain ways to specific phenomena. The research methodology used a range of open ended questions to allow the teachers to express more detailed opinions, rather than simply respond to a pre-determined question. One of the problems with questionnaires, particularly when only administered once, is that it is assumed that the respondents understand and answer questions in a similar way. The questionnaire used in this study was developed in consultation with teachers in the online PD department of the IB and a representative of the University of Melbourne. There was no opportunity to specifically trail the survey with IB teachers who had completed the online PD prior to conducting the study. This is a potential limitation of the data collection as it can be assumed that there were misinterpretations made of some questions. However, by the use of qualitative open ended questions, some of these misinterpretations can be seen and understood from the written comments made.

The research design makes considerable use of qualitative responses that are then coded by the researcher. In a sense this is a transformation of qualitative data to allow quantitative methods of analysis to be used. The survey instrument (Appendix A2) provides data that can be analysed using a mixture of qualitative and quantitative methods. However the sample was small, comprising 41 teachers from an overall population of approximately 105 teachers who have undertaken one of the courses. The figure of 105 is approximate as completely accurate records were not kept by the IB, but is considered to be nearly 100% correct. Approximately 15 of these teachers completed more than one course. The sample is not likely to provide a normally distributed set of teachers and, as mentioned previously, inferential parametric statistics are not appropriate.

A number of questions used a typical five point Likert response scale. It was expected that this would allow a range of descriptive statistics, in particular, frequency distributions to be used to explore difference between groups. For example, the data can be accessed by variables such as gender, level of experience with online, location, and culture. This allowed frequency distribution comparisons to be made. Given that the small sample size resulted in contingency cell counts less than 5 occurring frequently, it is considered unlikely that non-parametric tests such as the Chi-Square test could be used in to establish traditional statistical levels of significance between an observed and expected distribution. However, by combining Lickert scale responses it might be possible to perform some Chi-Square analysis to enable comparisons of responses based on variables such gender and culture. Fishers Exact Test will also be used as it is specifically designed for small sample sizes to enable data in the form of a 2 row by 2 column cell contingency table to be tested to see if there is a statistically significant difference between the two distributions.

There is debate in the literature (Jamieson, 2004) about the use of Lickert scale data as if it is continuous interval data, which allows the use of means and standard deviations as measures

of central tendency, and parametric inferential methods. The Moodle LMS, for instance, does produce mean statistics which makes the assumption that the data is interval data, whereas it is more correctly thought of as ordinal data. For this study the researcher has interpreted the Lickert scale data as discrete ordinal data, and has used the median and mode as appropriate to check if the mean produced in the Moodle output is consistent with the distribution represented by a frequency table. Any expression of the variability will use quartile data and not standard deviations. As the data is not continuous, bar charts will be used to display any graphical information.

The survey instrument used a number of questions that enabled teachers to provide personal reflective type comments. This qualitative data was expected to provide additional information that allowed individual teachers to express how they reacted to certain features of the online environment. The researcher was particularly concerned that the use of basic statistics can mask underlying trends and that the reactions of individual teachers, rather than group averaged responses, must be investigated. As mentioned above, the researcher coded the qualitative responses to certain questions to enable cross variable comparisons, such as between gender and culture, but also investigated the individual qualitative responses. This form of cross checking was used constantly in the analysis in order to minimise the chance for misinterpretation of a statistic.

It is acknowledged that the researcher was part of the system being investigated, and therefore not completely independent. The teachers were aware of this fact. It is possible that the sample was biased by including only those teachers who were largely satisfied with the online PD. However, as mentioned previously the IB's PD department has indicated that satisfaction levels are high with very few teachers expressing significant levels of dissatisfaction.

In summary, teachers' qualitative responses will be used by the researcher to determine the types of reactions which were common and uncommon. Qualitative data will be coded to allow frequency distributions to be investigated and to allow cross variable comparisons, e.g. gender and culture. The quantitative data collected will typically be presented and analysed using traditional descriptive statistics and presented using frequency distributions.

### **3.4 How data was collection from the teachers**

#### **3.4.1 Sources of data**

The majority of data for this research was gathered via the online survey administered to teachers. The other source of primary data was the three user logs available from the Moodle LMS.

#### **3.4.2 Teachers**

The Ethics Approval process was completed at the start of February 2009 and the survey distributed at this time. Information was obtained from the IB detailing the email addresses of the teachers who had enrolled in one or more of the courses. Each teacher was contacted via email and provided with a copy of the following:

- A copy of the Plain Language Statement outlining the nature of the project
- A copy of the Consent form
- Instructions on how to access the survey.

The Learning Management System used to deliver the courses was used to create a separate course called Evaluation. Most teachers had retained their login details, but were provided with a new login name if needed. Copies of the Plain English Statement, Consent Form and Instructions were also included on the website. Teachers opted to indicate consent by completing the online consent option. The survey was added as a Questionnaire to the LMS,

and other than a few minor problems provided a simple way for teachers to respond. The teachers experienced no difficulties accessing and completing the online survey.

The Moodle LMS provided access to the raw data in two ways: Report format which was useful as a reference and, Spreadsheet format, which was used to perform the analysis detailed in Chapter 4. The data could be downloaded in MS-Excel format. MS-Excel was used to perform the basic statistical analysis. Any non-parametric tests used were coded and performed directly by the researcher.

### **3.5 Justification of survey design**

A full copy of the survey instrument is shown in Appendix A2. Included in the appendix is a mapping of how the questions relate to the research questions. The survey instrument consisted of fifty three questions. Questions required respondents to either rank options, select yes or no, provide short specific information, or to provide a more detailed response.

#### **Questions and data related to the Research Questions**

What is presented here is a summary of specific questions and how they relate to assisting in gather data to help address specific research questions as outline in section 1.2.1. A summary of the type of analysis undertaken is also briefly outlined.

#### **Survey questions relating to Research Area 1**

The gender and cultural backgrounds of the teachers is the subject of the first two questions on the survey: Q1 & Q2. In relation to the first set of research questions, the data collected can then be filtered according to these two characteristics by comparing the frequency distributions for specific questions either by gender, cultural background, or gender and cultural background. Of particular interest is whether the teachers' stated learning preferences were met, and if there were any difference based on gender and/or culture.

Questions 4 to Question 18 related to IB requirements and are not used to support research findings in this study.

Questions 4 and 19 to 22 related to research question Q1.1 which considers the teachers' experiences starting the course and using the Moodle LMS.

Questions 23 to 27 allowed data related to research question 4 to be collected. The specific questions are outlined below. As it was not practical to administer a specific learning styles assessment, the strategy adopted was to ask the teachers to rank their preferences against specific statements in research question 23, and to then provide a series of qualitative comments describing how they preferred to learn something new and how the online environment met or did not meet their preference. The intention was to determine if teachers have a strong preference as their initial starting point for learning something new. The statements were not intended to classify the teachers according to one specific learning styles test. However the statements do provide a way to compare results from Kolb and Felder's tests. These two theorists were reviewed in Chapter 2. Kolb's learning style test was also used by Joy et al. (2007) to compare learning style to the GLOBE study of cultural differences.

Question 23 lists ten options that the teachers ranked. The first pair of options (a & b) is designed to enable a classification of the teachers into two groups- independent individual learners as compared to learners who prefer to learn with others. It was expected that options a & b would be answered in a dichotomous manner. The online environment might suit the first category more than the latter. In addressing this research question, the design allows for this question to be considered and also by looking at any differences that might exist between the different groups based on gender and/or culture. Option d enables investigation of teachers who have a preference to be taught by a teacher.



A preference to work on one's own or a neutral preference is likely to be an indication that the online environment would potentially present fewer problems than if the teacher had a preference to work in a group. When a teacher indicated a preference to work in a group, this was taken to imply they placed value on being able to discuss work in order to enhance understanding and learning. In an online environment one would expect such teachers to place importance on the use of forums, for example. Teachers who indicated a preference to learn on their own, or rated it a neutral preference, were interpreted as indicating an independent adult learner, irrespective of whether they preferred to be taught by a teacher. Having a preference to be taught by a teacher could be an indication of less independence that might impact on the attitudes that a teacher may have to an online environment.

Options c, i & j considered the issue of a preference for guided or unguided instruction. Options i & j also allowed consideration of a preference for experimentation rather than guided practical instruction. The former is potentially an indicator of a more independent adult learner. Finally, options g & h enabled investigation of a preference for the practical as compared to the theoretical.

Kolb (1984) stated that there tends to be a split between those who start by doing and those who start by watching, suggesting that we choose a way to grasp the experience (do/watch) and then chose how to transform the experience into something that is useful to us by feeling or thinking. Solomon and Felder (2009) also pointed to a distinction between active and reflective learners and also uses the terms sensing and intuitive learners. Intuitive learners tend to focus on the theory whereas sensors tend to focus on the practical. Solomon and Felder (2009) also referred to sequential and global learners. The intention of options g & h was to see if teachers have a preference for theoretical as opposed to practical learning material. The inference is that teachers who prefer practical learning material are more likely

to be active and sequential learners in the first instance rather than reflective and global learners.

Options e & f enabled investigation of groups who prefer a visual approach rather than an emphasis on written instruction. Solomon and Felder (2009) made particular reference to visual and verbal learners, and suggested that people learn best when material is present in both forms. The online environment should suit both preferences.

The details of Question 23 are shown below.

Q23 Before describing your preferred way to learn something new in the next questions, please rank each of the following statements as you feel they describe your preferred learning style: 1 – never preferred, 2: sometimes, 3: neutral, 4: prefer, 5: strongly prefer.

- a. I prefer to learn on my own
- b. I prefer to learn with others
- c. I learn best with a detailed step by step guide
- d. I learn best from a teacher or instructor
- e. I learn best from diagrams not written material
- f. I learn best from written material
- g. I need a broad overview to see how everything fits together
- h. I prefer to learn the theory rather than do practical exercises
- i. I prefer to learn from non-guided practical experimentation
- j. I prefer to learn from guided practical exercises

The data collected from responses to Question 23 enabled group frequency distributions to be generated, which then could be filtered based on gender, culture or any other classification that emerged during the analysis. Whilst a Lickert scale was utilised, the mean in association with the mode and/or median, were also used to provide a level of comparison between groups. This design allowed for the potential use of non-parametric tests such as Chi-Square testing to see if there were statistical differences present between groups based on comparisons between the overall distribution and the group.

It was intended to attempt to classify each teacher according to whether they exhibit independence, preference to work on one's own, and a preference for practical or experimental learning as opposed to theoretical learning. It was also possible to classify teachers in terms of preference for visual as compared to written material.

Q24 Describe your preferred way to learn something new.

Question 24 asked the teachers to describe their preferred way of learning, and this was included to give a balance to allow comparison to the structured responses using 10 ranked options. The data collected here was used to select representative responses, and to provide additional information on learning preferences that was used to interpret the data collected in Question 23.

Q25 Outline to what extent the online course suited your preferred way to learn.

Q26 Outline to what extent the online course did NOT meet your preferred way to learn.

Q27 Outline what improvements you would recommend be added to help meet your learning preference.

Questions 25 to 27 allowed an investigation of whether the online environment met the learning preferences of the teachers. This investigation could be made at a group level based on gender and/or culture, and also based on specific responses to both Question 23 and 24. For example, it was possible to see if there are differences between groups based on culture expressing a preference to learn on their own (Question 23(a)) and whether or not the online environment met their needs as compared with teachers in the same groups who did not express a preference to learn on their own.

Questions 28 to 30 asked teachers to comment on their motivation levels during the course, and relate specifically to research question Q1.2.

Q28 During any of the courses did you experience times when your motivation or desire to continue declined? Yes, No

Q29 If you answered Yes to Q28, please outline the reasons and describe how you were able to restore your motivation levels.

Q30 If you answered No to Q28, please outline the reasons your motivation levels remained positive.

Q31 If you have participated in a normal face-to-face IB Computer Science workshop could you briefly compare your face-to-face experience with the online experience.

Question 31 was included to enable a comparison to be made between the online courses and the face-to-face version, and is related to research question Q1.3. The reactions to this question can be linked to learning preferences. For example, it may be the case that teachers who express a preference to be taught in a traditional manner prefer the face-to-face option.

Q32 The course made extensive use of forums as a way to submit questions and assignments. Please briefly comment on how helpful the forums were to you learning.

This question related to research question Q1.4 and was included for two reasons. First, it is important to determine how well the forums were received as a way to interact with the online course, and second, in order to provide more data in relation to how different groups valued the use of forums as a means of interaction with other members of their course. Other than direct email contact, the only way to interact with the online teacher or other participants is

via the use of a forum. Teachers who do not prefer to work with others could place less emphasis on the importance of forums. It was also possible that groups based on gender and/or culture could also place different emphasis on the usefulness or otherwise of forums.

Q33 Outline briefly how the contact with fellow participants, especially during group work, was beneficial or otherwise to your learning during the course.

Q34 Outline briefly if you have maintained connections with fellow participant teachers you meet during the course.

These two questions related to research question Q1.5 and provided a way to collect data to see if contact with fellow teachers was seen as an important aspect of the online course. The IB is keen that online communities develop as a result of effective participation in the online PD. Whilst this was not a specific research question, it was possible to see if this aspect was supported by the course design and valued equally across all groups.

Q35 Describe briefly how the online courses have impacted on your teaching.

This related to research question Q1.6. It was important to determine if the courses impacted directly on teaching, and whether this was consistent across the different categories of teachers.

Question 36 to Question 39 are related to research question Q1.7.

Q36 The courses are presented in a controlled week by week manner. Please outline if this structure meet your needs or why you would prefer an alternative.

This question addressed an important characteristic of the course design. The controlled release of the course might not suit all teachers, and it was important to consider the reaction of teachers with different stated learning preferences as well from different gender and cultural groups.

Q37 The Online Workshop course provided a range of learning materials and activities. To what extent did you find these useful or not useful to your learning?

1: not very useful, 2: occasionally useful, 3: neither, 4: mostly useful, 5: very useful

Readings

Script marking

Dossier marking

Group work

Q38 The Online Java courses provided a range of learning materials and activities. To what extent did you find these useful or not useful to your learning?

1: not very useful, 2: occasionally useful, 3: neither, 4: mostly useful, 5: very useful

Readings

Reflective exercises

Practical programming tasks and assignments

Dossier simulation project

Group work

Q50 Indicate which of the following features are seen by you as important for online professional development courses.

1: of no importance, 2: little importance, 3: neither, 4: important, 5: very important

Tasks presented in a controlled and sequential manner

Some tasks enabling me to explore and experience uncertainty

Tasks directly relevant to my teaching

Tasks that include reflection that allow me to think deeply how I would approach my teaching

Tasks that enabled me to share my understanding with others.

Questions 37, 38 and 50 related to the research question Q1.7 and addressed an important set of characteristics of the courses, i.e. the types of learning material and their relative importance. In attempting to meet the needs of learners with diverse characteristics it was important to determine how different learning materials were received.

Question 52 aimed to determine attitudes of the group about how the course could be assessed in the future. The current assessment of an online PD environment is based on completion of the assignments. The IB is keen to move to a richer set of assessment criteria. This question was included to provide information on teachers' preferences and related to research question Q1.8.

Q52 Outline your reactions to the following points related to assessment and the awarding of certificates:

- a. There should be summative assessment task
- b. All assessment items should be graded rather than just noted as done or not done.
- c. An acceptable level of participation is necessary in group work or discussion
- d. Participants need to show a good level of reflection and critical thinking

## Questions related to Research Area 2:

The questions directly related to Research Area 2 are now considered.

Questions 45, 47, 48, 49 and 50 relate to research question 5, which investigates the ways the online teaching maintained interest, motivation to complete the course, and supported teacher learning.

Q45 Could you please indicate how important each of the following aspects was in relation to your interaction with the course facilitator.

1: of no importance, 2: little importance, 3: neither, 4: important, 5: very important.

Frequency of casual contact e.g. via email updates or reminders

Frequency of response to your specific requests

Length of responses as compared to speed of response

Timely feedback on assessment items

Effectiveness of responses to problems found.

Q47 Outline the most effective ways that the facilitator assisted in maintaining your interest in the course.

Q48 Outline the best practices followed by the facilitator and comment on how these assisted your learning.

Q49 If you fell behind at any stage, comment on your feelings at these times and outline how you were able to catch up and meet assessment requirements.

Q50 Indicate which of the following features are seen by you as important for online professional development courses.

1: of no importance, 2: little importance, 3: neither, 4: important, 5: very important

Tasks presented in a controlled and sequential manner

Some tasks enabling me to explore and experience uncertainty

Tasks directly relevant to my teaching

Tasks that include reflection that allow me to think deeply how I would approach my teaching

Tasks that enabled me to share my understanding with others.

Questions 45, 47 and 49 provided feedback on how the online teacher maintained interest and motivation of participants. The literature makes it clear that drop-out rates can be high in online courses, and so it was thought important to gain information in this area.

Questions 48 and 50 related to gaining feedback related to effective online teaching practices.

These questions were included as a way of determining if the characteristics of soundly



designed online environments were present from the point of view of the participating teachers, and also to gain some information about the importance of each.

Question 46 is related to research question 6.

Q46 Outline the importance of the level of empathy shown by the facilitator.

A key aspect investigated in this study was the importance of the human dimension of the online teacher's relationship with teachers enrolled in an online environment. The word empathy was used to focus teachers' attention on the way that the online teacher responded to requests that may have a personal or problematic dimension, for example personal problems requiring time extensions. It might also be that teachers with different characteristics, for example gender, cultural background, or stated learning preference viewed the importance of the level of empathy differently.

### **3.6 Analysis of the features of the online courses**

In Chapter 2 reference was made to what the literature suggests are desirable characteristics of online PD. These were used to create a set of criteria in order to assess the online courses. In terms of the study this assessment enabled consideration to be given to these characteristics in terms of how these were viewed by different groups, including attitudes to different forms of assessment. The criteria are re-stated below.

#### **Desirable Learning Criteria**

1. material presented is directly relevant to the professional needs of the teacher.
2. training is available on how to use the online learning management system.
3. material/structure facilitates active involvement rather than simply providing information.
4. participant is able to direct their own learning and work at a pace and sequence that suits them.

5. material/structure facilitates active discussion and collaboration with fellow participants.

### **Desirable Assessment Criteria**

1. assessment items enable participants to develop critical understand by providing authentic and challenging items that are directly relevant to the needs of the teacher.
2. assessment items enable participants to be able to construct, question and reflect to enhance their own understanding.

The outcomes of this analysis were compared with the attitudes of the teachers to see how they value the presence or absence of these features of an online PD environment.

## **3.7 Summary of Methodologies**

The study aimed to understand how teachers have perceived and reacted to the characteristics or phenomena of a specific online environment. The design methodology adopted fits within the phenomenological research model and made use of a mixed methodological approach to determine if there were differences between the groups of teachers based on gender, culture, stated learning preference or other differentiating characteristics.

### **3.7.1 Qualitative Methods Used**

The major qualitative method used was that of coding the responses and analysing representative or unusual responses. Coding allowed cross comparison via frequency distributions based on whole group responses, and also sub-groups based on gender and/or culture. For example, Question 46 was coded as important or less important, and examples used to describe the situations that teachers experienced. By coding in this manner it was possible to investigate if there existed any patterns, for example between gender and the level of empathy shown by the online teacher. Such comparisons were not intended to derive statistical significance, but rather it was expected that they would provide additional ways to interpret the qualitative responses.

### **3.7.2 Proposed Statistical Analysis**

Descriptive statistics were used where appropriate. For example frequency counts for gender and cultural background were used to describe the sample. Frequency distributions were used extensively to enable interpretation and to facilitate comparisons between sub-groups. For example the distribution of learning preferences were compared across gender and culture. Limited use was made of non-parametric tests, such as Chi-Square and Fishers Exact Test to test differences between groups based on gender and culture.

## Chapter 4 - Analysis

### 4.1. Introduction

This chapter presents the analysis of the data collected from the survey. The chapter then proceeds to consider the responses to individual or sets of questions as they relate to a specific factor. This analysis is then discussed in Chapter 5 specifically in relation to each of the research questions. Each section of the analysis is now briefly outlined.

- gender and demographic details

This initial section outlines the gender and demographic data related to the sample and population of teachers who had undertaken one of the IB online PD courses in computer science.

- teaching experience and qualifications

The experience and qualifications of the teachers in the sample is summarised.

- motivation for doing the course

Teacher's motivation for doing the course is outlined.

- experiences starting the course

The experience of teachers when they began the course is outlined.

- learning preference

The qualitative and quantitative data provided by teachers' about their stated learning preference is analysed.

- motivational issue during the course

This section considers the qualitative data provided by teachers about whether they experienced motivation dips during the course.

- comparison of face-to-face workshops and online workshops

A comparison based on qualitative responses by teachers who had undertaken both forms of the workshops is outlined.

- communication using forum

The qualitative data provided by teachers' describing their attitudes to the use of forums is outlined.

- contact with other teachers

This section considers the issue of development of an ongoing learning community.

- impact on teacher practice

This section considers the qualitative data provided by teachers about the impact of the online courses on their teaching practice.

- course format and time factors

This section considers the format of the course and when the teachers had undertaken the course.

- role of the online teacher and effective strategies used by the online teacher

This section considers the qualitative data provided about the importance of the role of the teachers. An analysis of the qualitative data provided by teachers about the effective teaching strategies is also provided.

- cultural issues reported by teachers

This section considers the statements made by teachers about any cultural issues or problems encountered by teachers.

- teacher perception of important characteristics of online PD

This section considers the quantitative data related to what the teachers perceived as important characteristics of online PD.

- attitudes to future developments in assessment.

An analysis of the attitudes expressed by teachers to future developments in assessment is undertaken.

- analysis of the features of the online courses

This section provides an analysis of the features of the online courses based on a checklist created by the researcher based on what the literature stated were desirable characteristics of an online PD environment.

## 4.2 Details of Sample and Population

### 4.2.1 Gender balance

The sample of online survey returns comprised 41 of the 105 teachers who had completed one of the online courses held between 2006 and February 2009. The characteristics of the sample as compared to the population are shown in table 4.1 below. In the population 69% were male as compared to 59% in the sample and 31% of the population were female as compared to 41% for the sample . Females were slightly overrepresented in the survey sample when compared to the whole population.

	<b>N</b>	<b>Male</b>	<b>Female</b>	<b>Male</b>	<b>Female</b>
<b>population</b>	105	69%	31%	72	33
<b>Sample</b>	41	59%	41%	24	17

Table 4.1: Comparison of Population and Sample.

The sample comprised 26 teachers who had completed the workshop, 8 who had completed the HL course, and 7 who had completed the SL course. The comparative proportions of the sample as compared to the population are shown below in Table 4.2 and indicate that the sample is reasonably representative of the population in terms of the distribution of courses taken.

	<b>Population</b>	<b>Male</b>	<b>Female</b>	<b>Sample</b>	<b>Male</b>	<b>Female</b>
<b>Workshop</b>	69 (58%)	70%	30%	26(63%)	61%	39%
<b>HL</b>	28(24%)	54%	46%	8(20%)	62%	38%
<b>SL</b>	22(18%)	41%	59%	7(17%)	43%	57%

Table 4.2: Distribution of population and sample across different courses

#### 4.2.2 Geographic Distribution of schools and participants in the sample

The distribution of the location of schools using the GLOBE (Gupta et al. 2002) classification is shown in Table 4.3. The total shown is the number of teachers in the sample, the columns headed M indicate male teachers, and those headed F indicate female teachers in the sample.

1	Anglo Cultures	School Location	Total	M	F	6	Latin America	School Location	Total	M	F
		USA	11	8	3			Brazil			
		Canada	1	1	0			Colombia			
		Australia	1	1	0			Guatemala	1	1	
		UK	1	1	0			Mexico	3	0	3
		NZ	1	1	0			Peru	1		1
		Bermuda	0	0	0	7	Africa - Sub Sahara				
2	Latin Europe							Ghana	1	1	
		Belgium	0	0	0			Kenya			
		Portugal	1	1	0			Tanzania			
3	Nordic Europe					8	Arab Cultures				
			0	0	0			Bahrain			
			0	0	0			Egypt			
			0	0	0			Jordan			
4	Germanic Europe							Oman	2	2	
		Germany	2	1	1			Pakistan			
		Netherlands	0	0	0			Qatar			
		Switzerland	1	1	0			Saudi Arabia	1		1
5	Eastern Europe							UAE			
		Bosnia						Tunisia			
		Croatia	1	1	0	9	India - South Asia				
		Lituania	1	0	1			India	4	3	1
		Slovak Republic						Indonesia	1		1
		Poland	1	0	1			Thialand	1		1
		Romania	1	0	1			Bangladesh			
		Russia						Philippines			
								Sri Lanka			
								Vietnam			
						10	China- Korea, Sing				
								China	3	3	
								Korea			
								Singapore			

Table 4.3: Distribution of schools in the sample by location.



The geographic distribution of the schools in the sample is compared to the population in

Table 4.4 below.

	<b>GLOBE Cultural Group</b>	<b>Pop n</b>	<b>Male</b>	<b>Female</b>	<b>Sample</b>	<b>Male</b>	<b>Female</b>
1	Anglo Cultures	33 (31%)	25	8	15 (37%)	12	3
2	Latin Europe	3 (3%)	3	0	1 (2%)	1	0
3	Nordic Europe	1 (1%)	1	0	0 (0%)	0	0
4	Germanic Europe	3 (3%)	2	1	3 (7%)	2	1
5	Eastern Europe	10 (10%)	6	4	4 (10%)	1	3
6	Latin America	14 (13%)	6	8	5 (12%)	1	4
7	Africa – sub Sahra	4 (4%)	3	1	1 (2%)	1	0
8	Arab Cultures	16 (15%)	11	5	3 (7%)	2	1
9	India – South Asia	12 (11%)	7	5	6 (15%)	3	3
10	China – Korea – Singapore	9 (9%)	8	1	3 (7%)	3	0
	<b>Total</b>	<b>105 (100%)</b>			<b>41 (100%)</b>		

Table 4.4: Geographic distribution of schools in the sample compared to the population.

The purpose of this table is to show representativeness of the sample in comparison to the population based on the location of the school from which the teachers came. From the table we can see that 31% schools in the population were from Anglo cultures with 37% schools in the sample coming from the same group. Likewise, we can see that the cultural groupings of the sample are at least of a similar proportion to the population, but clearly the sample is not random.

### 4.2.3 Cultural Distribution of sample

On the survey teachers were asked to indicate their country of birth. Using the GLOBE classification, the cultural distribution of the sample was compiled and is shown in Table 4.5. This distribution is different to the one based on the location of the school the teacher taught in when they did one of the online courses.

1	Anglo Cultures		Total	Male	Female	6	Latin America				
		USA	13	8	5			Brazil			
		Canada	0	0	0			Colombia			
		Australia	0	0	0			Guatemala	1	1	0
		UK	8	7	1			Mexico	2	0	2
		NZ	0	0	0			Peru	1	0	1
		Bermuda	0	0	0	7	Africa - Sub Sahara				
2	Latin Europe							Ghana	1	1	0
		Belgium	0	0	0			Kenya			
		Portugal	0	0	0			Tanzania			
3	Nordic Europe					8	Arab Cultures				
			0	0	0			Bahrain			
			0	0	0			Egypt			
			0	0	0			Jordan			
4	Germanic Europe							Oman			
		Germany	1	0	1			Pakistan	1	0	1
		Netherlands	0	0	0			Qatar			
		Switzerland	0	0	0			Saudi Arabia			
5	Eastern Europe							UAE			
		Bosnia						Tunisia			
		Croatia	2	2	0	9	India - South Asia				
		Lituania	1	0	1			India	5	4	1
		Slovak Republic						Indonesia			
		Poland	1	0	1			Thailand			
		Romania	1	0	1			Bangladesh			
		Russia						Phillipines	1	1	0
								Sri Lanka	1	0	1
								Vietnam			
						10	China- Korea, Sing				
								China	1	1	0
								Korea			
								Singapore			

Table 4.5 Cultural distribution of the Sample

This data is summarised in Table 4.6 shown below. The most common cultural group is that of Anglo (51%) which is dominated by teachers born in the USA (32%), all of whom also teach in the USA, with 8 (20%) of teachers educated in the UK. Teachers educated in the UK work in a variety of countries. The next most common grouping is that of India and South Asia representing 20% of the teachers, followed by teachers from Latin America (10%) and Eastern Europe (12%). These teachers tend to also teach within these countries.

	<b>Cultural Group</b>	<b>Total Sample</b>	<b>Male</b>	<b>Female</b>
1	Anglo Cultures	21	15	6
2	Latin Europe	0	0	0
3	Nordic Europe	0	0	0
4	Germanic Europe	1	0	1
5	Eastern Europe	5	2	3
6	Latin America	4	1	3
7	Africa – sub Sahara	1	1	0
8	Arab Cultures	0	0	0
9	India-South Asia	8	4	4
10	China-Korea-Singapore	1	1	1
		41		

Table 4.6: Summary of Cultural background of teachers in the Sample

### 4.3 Teaching Experience and Qualifications

Teachers in the sample were highly qualified and experienced, both within the IB system and other education systems. The data relating to teacher experience is summarised in Tables 4.7a and 4.7b, and the data relating to teacher qualifications is shown in Table 4.8. All teachers had tertiary qualifications, with 66% having specific IT or Computer Science qualifications. On average the group had 14 years teaching experience. However the group on the whole had limited experience of personally using an online education system, with only 17% stating that they were experienced users.

On the surface there was no difference in the distribution of qualifications, teaching experience or experience with online learning based on factors such as, gender or cultural background.

<b>Level of Experience</b>			<b>M</b>	<b>F</b>	<b>%M</b>	<b>%F</b>
First	15	37%	10	5	24%	12%
Some	19	46%	12	7	29%	17%
Experienced	7	17%	2	5	5%	12%
	41					

Table 4.7a: Level of teacher experience

<b>Years of Teaching</b>	
Average	14
IB School	7
IB CS	4
IT/CS	10

Table 4.7b: Years of Teaching

<b>Qualifications</b>	<b>Total</b>
PHd	1
Masters IT	15
Masters Other	8
Degree IT	11
Degree Other	6
	41

Table 4.8: Teacher Qualifications

#### **4.4 Motivation for doing the courses**

The most common reason for doing the PD course was personal motivation (64%), with the remainder (36%) stating their school required them to undertake the course as part of their school's professional development program. Certification was not a motivational factor, as 85% of the teachers stated that they would have enrolled in the course without certification from the IB.

#### 4.5 Experiences starting the course

In general the teachers expressed a high degree of satisfaction (95%) with the initial materials received that were intended to explain the nature of the courses and required teachers to familiarise themselves with the Moodle learning management system. This material was not intended as training material, nor did it contain any educational material about how to use an online learning environment.

As one participant explained: *“Material is excellent, according to me no improvements required.”* (Teacher 21, Male, India)

The Learning Management System did not present difficulties for 87% of the teachers. However the initial activity required teachers to use a Wiki to introduce themselves and ask any questions they particularly wanted addressed. The intention was to get teachers actively involved, and to start interacting with other participants. This activity was referred to specifically by one highly qualified and experienced teacher, *“With many participants, including myself, having no experience with Moodles, there were problems at the beginning with various people deleting others”*. (Teacher 7. Female, USA)

Another person reported general initial difficulties operating Moodle: *“It is not very friendly and spontaneous, however can be a good tool once you are used to”* (Teacher 20, Female, Mexico). This was consistent with feedback from another teacher who found, *“Navigation on site was convoluted. It was difficult to figure out where to start, or where assignments were posted”*. (Teacher 1, Female, USA)

Only one person referred to problems downloading documents, *“Sometimes downloading documents were very slow and was frustrating. Other than that I didn't find any problems”*. (Teacher, 25, Female, Sri Lanka)

There were two further comments that the interface could be improved, *”Personally I felt that the user interface was not as intuitive as one may desire, specially working with the Microsoft Type of User interface most of the time. But, having said that, it was not a major issue”*.

(Teacher 28, Male, India)

Despite the initial reservations expressed by these teachers, some teachers were able to use the LMS without experiencing major ongoing difficulties accessing or operating the online learning system. This also confirmed an assumption that because the teachers were computer science teachers it was not anticipated that the LMS would present ongoing problems. The analysis has confirmed that this assumption was reasonable for this group of participants. However, clearly some teachers experienced problems, particularly at the start.

#### **4.6 Teacher Expressed Learning Preferences**

This section considers the teachers’ expressed learning preferences. The first part provides an analysis of the group level data and the second part provides an analysis based on attempting to classify each individual teacher, and the third section provides an analysis of the qualitative data provided by teachers about their preferred learning preference.

##### **4.6.1 Group level analysis**

The study seeks to consider as a research question if there were differences in the attitudes of teachers to the online courses based on the stated learning preference of the teacher. Teachers were firstly asked to respond to ten statements aimed at determining preferences in how participants liked to learn something new. Each of the ten statements was ranked using a five point scale: 1: never, 2 sometimes, 3 neutral, 4 prefer, 5 strongly prefer. The statement and the mean response to each were compiled using the Moodle survey management system and

are shown in Table 4.9. The frequency distribution for each is shown using percentages in Table 4.11 below and was calculated using MS-Excel.

<b>Nos.</b>	<b>Description</b>	<b>Mean</b>	<b>Mode</b>
<b>1</b>	I prefer to learn on my own	3.97	4
<b>2</b>	I prefer to learn with others	3.18	3
<b>3</b>	I learn best with a detailed step by step guide	3.72	4
<b>4</b>	I learn best from a teacher or instructor	3.54	4
<b>5</b>	I learn best from diagrams not written material	3.26	3
<b>6</b>	I learn best from written material	3.23	3
<b>7</b>	I need a broad overview to see how everything fits together	4.15	4
<b>8</b>	I prefer to learn the theory rather than do practical exercises	2.36	2
<b>9</b>	I prefer to learn from non-guided practical experimentation	2.87	3
<b>10</b>	I prefer to learn from guided practical instruction	3.90	4

Table 4.9: Teacher mean responses expressing learning preference

The first column represents the statement number and the second column shows a description of the statement the teacher responded to and the last two columns show the mean and mode of the responses, which includes the neutral value of 3. A value greater than 3 indicates a preference, while a value of less than 3 indicates that the statement does not represent a preference.

Before investigating the distributions, using the data in Table 4.9 some tentative claims can be made about the preferences of the teachers in the sample.

In general, teachers in the sample indicated preferences for all statements other than for statements 8 and 9.

Teachers indicated a strong preference to learn on their own, but also indicated that they also valued learning with others. This indicates that respondents did not see these two options as mutually exclusive.

A strong preference was shown for learning from guided practical instruction and from the use of step-by-step guides. Less preference was expressed for the use of non-guided practical experimentation.

A strong preference was indicated for learning from practical exercises rather than from theory. However a strong preference was indicated for the need to be shown a theoretical overview to see how things fit together.

The aggregate mean value was also investigated by controlling for male and female overall, and also by looking at two specific cultural groups: 1 Anglo and 9 Indian-South Asia, also controlling for male and female. Other cultural groupings were not included due to low numbers. The data for this set of comparisons is shown in Table 4.10 below.

Groups	Questions									
	1	2	3	4	5	6	7	8	9	10
<b>Overall</b>	3.9	3.2	3.7	3.5	3.3	3.2	4.2	2.3	2.9	3.9
<b>Male</b>	3.9	3.3	3.6	3.6	3.5	3.3	4.2	2.4	3.0	3.8
<b>Female</b>	4.0	3.1	3.9	3.5	3.2	3.1	4.2	2.3	2.7	4.0
<b>1</b>	4.0	3.1	3.7	3.2	3.3	3.3	4.2	2.5	3.0	3.8
<b>Male</b>	3.9	3.3	3.6	3.4	3.7	3.1	4.2	2.5	3.1	3.9
<b>Female</b>	4.3	<b>2.5</b>	3.8	<b>2.7</b>	<b>2.3</b>	3.7	4.2	2.3	2.7	3.5
<b>9</b>	4.0	3.6	4.3	<b>4.5</b>	3.5	3.4	4.3	2.0	2.5	4.5
<b>Male</b>	4.0	3.8	4.3	<b>4.5</b>	3.3	4.3	4.5	2.0	2.5	4.5
<b>Female</b>	4.0	3.5	4.3	<b>4.5</b>	3.8	2.5	4.0	2.0	2.5	4.5

Table 4.10: Comparison of learning preferences controlling for male/female and across cultural groups (1) Anglo and (9) Indian-South Asia.

No major observable differences can be seen between any of the groups, as the mean is consistent across each group. There are two possible exceptions. The means for Anglo females, on item 2 (prefer to learn with others), item 4 (learn best from a teacher) and item 5 (learn best from diagrams), are a little lower than the overall means for these items, indicating a possible negative preference as compared to a neutral preference. The cultural grouping of



India-South Asia also expressed a stronger preference for item 4 (learn best from a teacher) as compared to the other groups.

The mean is an aggregate statistic and can mask underlying patterns, especially if responses do not fall into a symmetric distribution. It has also been calculated from ordinal rather than interval data. The data shown below in Table 4.11 represents the frequency distribution for the responses 1 to 5 expressed using a percentage for each of the ten statements. For the most part the mean and mode are consistent with the nature of the distribution, i.e. a mean or mode close to 4 is related to a positively skewed distribution and a mean closer to 2 is related to a negatively skewed distribution.

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>1</b>	0%	2%	0%	0%	0%	2%	0%	20%	12%	0%
<b>2</b>	12%	27%	12%	17%	22%	24%	2%	37%	24%	12%
<b>3</b>	15%	32%	20%	29%	34%	29%	10%	34%	34%	15%
<b>4</b>	41%	27%	51%	37%	32%	39%	54%	10%	24%	49%
<b>5</b>	32%	12%	17%	17%	12%	5%	34%	0%	5%	24%
<b>Mean</b>	3.9	3.2	3.7	3.5	3.3	3.2	4.2	2.3	2.9	3.9
<b>Mode</b>	4	3	4	4	3	3	4	2	3	4

Table 4.11 Frequency distribution of teacher responses to learning preferences

To show strong and weak preferences more clearly, the data was expressed by combining rows 1 and 2 from Table 4.11 into a percentage that indicated a weak preference and rows 4 and 5 to indicate a percentage to show strong preference. The neutral data was ignored for the purposes of this analysis. The resulting data is shown in Table 4.12 and includes a column headed Level to indicate either a Positive, Balanced or Negative preference for a particular statement. A balanced preference indicates that the percentage of teachers indicating little or strong preference were equal. A positive or negative preference is indicated if either column is close to 50%. Weak positive is used to indicate situations where the distribution is positively skewed but where there is a reasonable proportion who have indicated little preference. As can be seen in Table 4.12 there was a positive preference for statements 1, 3,

4, 7 & 10, and weak positive preference for statements 5 and 6. A negative preference was expressed for only statement 8. Teachers were more divided in their responses to statements 2 & 9.

	<b>Mean Mode</b>	<b>Little Preference</b>	<b>Neutral</b>	<b>Strong Preference</b>	<b>Level</b>
1. I Learn best on my own	3.9 (4)	12%	15%	73%	Positive
2. I Learn best from others	3.2 (3)	29%	32%	39%	Balanced
3. I learn best with a detailed step by step guide	3.7 (4)	12%	20%	68%	Positive
4. I learn best from a teacher or instructor	3.5 (4)	17%	29%	54%	Positive
5. I learn best from diagrams not written material	3.3 (3)	22%	34%	44%	Weak Positive
6. I learn best from written material	3.2 (3)	26%	29%	44%	Weak positive
7. I need a broad overview to see how everything fits together	4.2 (4)	2%	10%	88%	Positive
8. I prefer to learn the theory rather than do practical exercises	2.3 (2)	57%	34%	10%	Negative
9. I prefer to learn from non-guided practical experimentation	2.9 (3)	36%	34%	29%	Balanced
10. I prefer to learn from guided practical instruction	3.9 (4)	12%	15%	73%	Positive

Table 4.12: Level of preference for learning preference statement

As with the mean of the responses for each of the ten learning preference statements, the frequency distributions were also analysed by controlling for gender and cultural groupings. Three of these analyses are included to illustrate this point. The first analysis considers the frequency responses for the first statement ‘1. I prefer to work on my own’, shown in Table 4.13. On inspection of the distributions it can be seen that each grouping shows a strong preference to learn on one’s own, which is consistent with the data shown in Table 4.12.

	<b>General</b>	<b>Male</b>	<b>Female</b>	<b>1 Anglo</b>	<b>1 male</b>	<b>1 female</b>	<b>Other Culture</b>	<b>9 India/South Asian Culture</b>
1	0%	0%	0%	0%	0%	0%	0%	0%
2	12%	8%	18%	10%	7%	17%	17%	13%
3	15%	21%	6%	19%	27%	0%	8%	13%
4	41%	46%	35%	33%	40%	17%	58%	38%
5	32%	25%	41%	38%	27%	67%	17%	38%
	100%	100%	100%	100%	100%	100%	100%	100%
n=	41	24	17	21	15	6	12	8

Table 4.13: Frequency distribution controlling for gender and cultural groups: prefer to work on my own

As indicated above, the mean for female respondents for statements 2, 4 and 5 was lower than the means for the group as a whole. In order to investigate this situation the individual distribution of responses for these statements was further analysed.

Statement 2: ‘I prefer to learn with others’, was considered by controlling for gender to enable comparisons between the overall sample, the Anglo-culture and other cultural groups. The frequency distributions for statement 2 are shown below in table 4.14.

	<b>Overall</b>	<b>Male</b>	<b>Female</b>	<b>1</b>	<b>1 Male</b>	<b>1 Female</b>	<b>Other</b>
1	2%	0%	6%	0%	0%	0%	5%
2	27%	29%	24%	38%	27%	67%	15%
3	32%	33%	29%	29%	33%	17%	35%
4	27%	21%	35%	19%	20%	17%	35%
5	12%	17%	6%	14%	20%	0%	10%

Table 4.14: Frequency distribution for statement 2

The distributions are consistent, with the possible exception of female participants from the Anglo-culture grouping where 67% (4 of 6 teachers) indicated a strong preference to prefer not working with others as compared to approximately 25% to 30% for other groupings. A Chi-Square statistic was not calculated because the overall cell numbers were less than 5.

Statement 4: ‘I learn best from a teacher’ was further investigated and the resulting distributions are shown below in Table 4.15. The distributions are consistent across the

groups with the exception of the majority (50%, 3 of 6) of female teaches from the Anglo-cultural grouping indicating a negative preference.

	<b>Overall</b>	<b>Male</b>	<b>Female</b>	<b>1: Anglo</b>	<b>1: Male</b>	<b>1: Female</b>
1	0%	0%	0%	0%	0%	0%
2	17%	17%	18%	29%	20%	50%
3	29%	25%	35%	33%	33%	33%
4	37%	42%	29%	29%	33%	17%
5	17%	17%	18%	10%	13%	0%

Table 4.15: Frequency distribution for statement 4

Statement 5: ‘I learn best from diagrams’ was further investigated and the resulting distributions are shown below in Table 4.16. The overall distribution indicates a preference for diagrams by 44% of the sample. Overall 50% of males expressed a stronger preference as compared to 36% for females. In the Anglo-cultural grouping this preference was even stronger with 66% of males expressing a preference for diagrams as compared to written material. 67% of females in the Anglo-cultural grouping indicated a strong negative preference.

	<b>Overall</b>	<b>Male</b>	<b>Female</b>	<b>1: Anglo</b>	<b>1: Male</b>	<b>1: Female</b>
1	0%	0%	0%	0%	0%	0%
2	22%	13%	35%	24%	7%	67%
3	34%	38%	29%	29%	27%	33%
4	32%	42%	18%	38%	53%	0%
5	12%	8%	18%	10%	13%	0%

Table 4.16 Frequency distribution for statement 5

The responses for statements 2 and 5 from female teachers classified as members of the Anglo-culture were consistent. Female teachers expressing a negative preference on option 2 also expressed a negative preference on option 5.

In summary, using the quantitative data at the group level, in response to the ten statements about learning preference, the group indicated a strong preference for wishing to learn on their own, using step-by-step or guided practical instruction rather than theory, but with the

provision of a broad overview. There was also a strong preference shown to be taught by a teacher. The group was split evenly between a preference for diagrams and written material. There was a balance of preference for using non-guided practical experimentation and learning with others.

With the group level analysis, differences based on gender were found on three of the options. Female teachers from the Anglo-cultural group indicated they did not prefer to learn with others, they did not learn best from a teacher, and did not prefer diagrams to written material. In contrast, male teachers expressed the opposite preferences on these three options. No cultural differences were found other than teachers from the Indian-South Asia cultural grouping expressing a very strong preference to learn from a teacher.

#### **4.6.2 Individual teacher analysis**

It proved to be difficult to classify each teachers as individuals. One problem was the issue of how to classify people who indicated a preference for both statements (a) & (b), or as in two cases a preference for neither. It was decided to specifically classify only those who indicated a clear consistent preference otherwise they were recorded as indicating a neutral preference. For example, teachers who responded 5 and 5 were classified as neutral. Preference to work on one's own was intended to indicate the level of learner independence to self direct. A preference for guided practical or experimental work in preference to theoretical material was intended to indicate the degree of active as opposed to a reflective learning style. Preference for a teacher or preference for visual as compared to written material was ignored for the purposes of this analysis. This analysis identified six groups as shown in Table 4.17.

<b>Preference</b>	<b>Practical Guided</b>	<b>Experiment</b>	<b>Theory</b>
<b>Own (17)</b>	13 M(7)(4,3) F(6)(3,3)	4 M(3)(2,1) F(1),(1,0)	0
<b>No preference (19)</b>	13 M(7)(3,4) F(6)(2,4)	2 M(2)(1,1) F(0)(0,0)	4 M(3)(3,0) F(1)(0,1)
<b>Group (4)</b>	4 M(2)(1,1) F(2)(0,2)	0	0

Table 4.17: Individual teacher learn style assessment (note: 1 teacher could not be classified)

The three column headings indicate a preference for either practical guided material, to experiment first, or have theoretical instruction first. The three rows indicate a preference to work on one's own, no preference, or to prefer a group setting.

The format of the cells is as follows: Total, Sex(count)(Anglo, non-Anglo), e.g. the data (13 M(7)(4,3) F(6)(3,3) in the cell showing those who preferred to work on their own and use practical guided material indicates there are 13 teachers in this group, of which 7 were male and 6 female. The males were divided into 4 from Anglo backgrounds and 3 from non-Anglo backgrounds, and the females were divided 3 from Anglo and 3 from non-Anglo backgrounds.

When the data is considered in this way, 90% (36/40 or the sum of the first two rows) of teachers were characterised as independent learners. Of these, 65% preferred active practical guided material. Only a small number of teachers could be considered dependent, i.e. preferred to learn in a group (10%) or as reflective theoretical learners (10%) as opposed to active learners: even these teachers also indicated a preference to learn with guided material. Of these two small groups of 4 teachers, 3 teachers had a strong preference to be taught by a teacher. In the group classified as independent learners 50% of the teachers indicated a strong preference to be taught by or have access to a teacher. Six (15%) indicated a preference for more self direction by active experimentation in preference to practical guided teacher supplied material. Whilst the data is small in size it is worth noting that this analysis shows

that the experimenters were mostly male from an Anglo cultural background, the teachers preferring a theoretical approach were mostly male, again from an Anglo cultural background and the group preferring to not work on their own was divided between two males from each cultural group and two females from a non-Anglo cultural group. The outcomes of this analysis are reasonably consistent with the group level analysis except there are less preferring to work in a group. This analysis is approximate and based on a somewhat subjective interpretation of the data, but it is reasonable to conclude that most teachers preferred practical guided instruction and to work on their own, but a number of these teachers were also happy to work with others. A high proportion of teachers in each group wished to be taught by a teacher.

The dominant learning preference was for practical guided instruction and this was consistent across gender groups and cultural groups.

#### **4.6.3 Qualitative Data – teacher learning preferences**

In order to further establish learning preferences, teachers were also asked in Question 24 to outline how they preferred to learn something new and to also comment in Questions 25 and 26 on how the online learning system meet or did not meet their preferred way to learn. The qualitative data provided by the teachers was analysed by grouping commonly expressed terms e.g. experimentation, work at own pace etc. The result of coding the data is shown in table 4.18. Only two teachers did not respond to this question, however, the percentage frequencies are expressed using an n=41 rather than using n=39 to avoid overstating the proportions.

Code	Preference expressed	Frequency Distribution
1	Self directed, use practical guides and then experiment	28 (68%)
2	Overview of how material fits together	4 (10%)
3	Teacher explanations	5 (12%)
4	Detailed Technical Manuals	1 (2%)
5	Discussion	1 (2%)

Table 4.18: Frequency Distribution for Teachers expressed learning preference

The most common preference, expressed by 68% of teachers, could be classified as to self direct their own learning using practical guides or tutorials and then be able to have time to experiment. Whilst a small proportion had indicated that they preferred to experiment in the previous analysis only one of the teachers specifically mentioned this by simply stating a preference to ‘*experiment*’ (Teacher 1, Female, USA). A small number of teachers (10%) also indicated a need to have overview material included with the practical guides. Teachers from the Indian-South Asian cultural grouping comprise most of the 12% who indicated a strong preference to also have access to explanations from an expert teacher. But this group also expressed the desire to self direct and experiment. Only one teacher indicated a strong need to have access to detailed technical manuals, but again indicated that this was seen as important to support a self directed approach. Only one teacher directly mentioned a need to discuss what they were learning as a major preference.

As with any coding, a certain amount of detail is lost in attempting to reduce complex reflections into simpler neater coded statements. A number of representative comments from the teachers are shown below. The first six comments are typical and indicate a preference for actively doing and would probably fit into Kolb’s notion of a preference for accommodating by active doing and concrete experience, and into Solomon and Felding’s notion of active learners. The bold text highlights the preference for doing.

***Hands on - example and follow up exercises.*** (Teacher 6, Male, UK)



*Be shown a quick intro, then **attempt** some practical exercises and have **it demonstrated** where each exercise fits into the bigger picture. (Teacher 41, Male, Scotland)*

*I like to **do things** hands-on, in an authentic way. (Teacher 37, Male, USA)*

*Be shown example, and step by step guide. Then allowed **free experimentation**. (Teacher 38, Male, UK)*

*I **prefer doing something** myself first. I use a **practical approach** to most of the stuff I learn. Theory for me becomes boring. (Teacher 12, Female, Pakistan)*

*I prefer to learn something new through **guided practical exercises**. Preparing questions and analysing answers and getting a feedback on my understanding. (Teacher 30, Female, India)*

The following comments are less representative and indicate variations of emphasis, which is lost in the coding summarisation process.

*I like to have a chance to **explore** something after **some basic instruction** from a **teacher**, but to have that teacher available as a resource if needed. My ideal would be an appropriate introduction and then an assignment which allows me to explore a concept. But I like having someone to contact when I get stuck. I also really like having **classmates to talk** with about ideas. Explaining, questioning and discussing with peers is very valuable to me. (Teacher 22, Male, USA)*

Here the teacher clearly articulates the role of the teacher as the initiator of the source of information, then the teacher wishes to explore and be able to do some type of consolidating assignment, they also indicate the desire to explore and discuss with others. This is one of the four teachers who indicated a strong preference to learn with others, to prefer a teacher, strongly prefer written material over visual and to have guided learning materials.

The following two teachers indicate the same preference for guided study but the capacity to self initiate. Neither specifically refers to the need for a teacher. Teacher 36 is neutral in expressing a preference for a teacher, but a strong preference to work on her own, but also values working with others. She has a strong preference for written guided practical material.

Teacher 2 has a clear preference to work on her own and a very strong preference for visual rather than written material, although this is not mentioned in the comment, and a strong preference for practical rather than theory.

*I prefer blended learning: self study mixed with guided study, written material giving me the possibility to go back to different aspects that need deeper analysis. (Teacher 36, Female, Romania).*

*Trial and error. I like to test things, solve problems, find solutions. From there I can derive the theory. (Teacher 2, Female, Peru)*

The next teacher strongly expresses a preference, in response to the 10 statements, for non-guided rather than guided learning material, strongly preferring not to have either a detailed step-by-step guide or guided material. States a strong preference for visual rather than written material and the role of the teacher is also seen as important. There is no preference expressed to work on their own or with others – both rated at 2. This teacher would be in Solomon and Felding's terms an equally active/reflective and sensing/intuitive learner.

*First a description of the overall concept, then some real life relation to the theory. Subsequently, practice or more theory only goes to cement the learning process. (Teacher 29, Male, Ghana)*

The following teacher is the second of the teachers who indicated a strong preference to not work on their own but with others. The teacher describes a traditional classroom setting as the best way they learn, in other words probably likes structure or what they are familiar with. In terms of Kolb the teacher would most likely fit into the reflecting/conceptualisation preference, preferring to hear and think before doing and experiencing.

*I learn better interacting face-to-face with an instructor. I learn by hearing and taking notes rather than just reading material. (Teacher 32, Male, USA)*

The second last comment has a different emphasis again. This teacher indicated a very strong preference to work on their own but was happy to work with others, and strongly preferred a

teacher and written material. The comment indicates an independent learner who wants access to detailed written material. This particular teacher is highly qualified with a PhD.

*Personally I prefer to have softcopies of documents/manuals to facilitate reading on the computers/laptops. (Teacher 28, Male, India)*

Teacher 33 is the only teacher to comment that their learning preference depends on what it is they are learning. The teacher rates a number of the learning preference statements as neutral.

There is clear preference for guided material rather than non-guided material and a low preference for theory. From the comment the teacher is equally at home learning in a group or individually.

*It depends on what I'm to learn. I studied well at the OU by reading and practicing the structured course material but I also learn well by discussion with others. Learning a foreign language which I have done requires periods of immersion. Playing musical instruments requires watching video and listening to pieces again and again. So it depends on what is to be learnt. (Teacher 33, Male, UK)*

The comments demonstrate that the researchers' coding that determined a preference for guided instruction seems to be a reasonable one. The comments also lend weight to the conclusion that a number of teachers had a preference to work alone but with the capacity to be involved with a teacher and/or to discuss with others, but this latter preference was not commented on directly by a many of the teachers.

Question 25 asked the teachers to indicate how the online environment met their learning preference. The qualitative data provided by teachers was classified into five main ways the online system was able to meet their learning needs: provision of practical exercises, able to work at own pace, teacher responsiveness, balance of theory and practical, and access to collaboration. The distribution is shown below in table 4.19. Whilst most teachers responded, 6 did not, however again the percentage is calculated using  $n=41$ , the sample size.

Code	Description	Frequency
1	Practical exercises	14 (34%)
2	Work at own pace	8 (20%)
3	Responsiveness of teacher	5 (12%)
4	Balance of theory and practical aspects	2 (5%)
5	Collaboration	6 (15%)

Table 4.19 Frequency Distribution of teachers response to Question 25: How the online environment meet their learning preference.

The two most common ways that the online environment met the learning preferences of teachers were by enabling access to practical exercises and being able to work at a pace that suited the teacher. Collaboration was mentioned by only 15% of teachers. The responsiveness of the online teacher was seen as important by 12% of the teachers. Only a small number of teachers mentioned balancing theory and practical aspects.

The selected comments of the same teachers from above are now analysed. The first group indicate a liking for the online environment as they could manage the time better. Two of the teachers specifically mention the importance of being able to discuss, interestingly both had rated working with others as neutral and showed a preference to work on one's own.

*Very much so. (Teacher 6, Male, UK)*

*Allowed for different time zones. Liked working in pairs/small groups within the course - needed to meet deadlines and did not procrastinate! Interactive aspect is very important to me. Feedback and 'banter' helps! (Teacher 41, Male, Scotland)*

*The course suited my preferred way to learn, as there were many opportunities to do authentic tasks. (Teacher 37, Male, USA)*

*Time could be allocated myself - there just wasn't enough! (Teacher 38, Male, UK)*

*There were exercised to do and then discuss on the forum. If I used to get stuck, I used to e-mail the facilitator and then he used to help me out. (Teacher 12, Female, Pakistan)*

*The gradual approach and practical exercises on all aspects helped me. (Teacher 30, Female, India)*

The following teacher indicates the self-paced aspect was important and that the environment matched their learning preference. This teacher had indicated a preference to work with others and to be taught by a teacher.

*The online course was a pretty good match for my learning style. It gave adequate instruction and allowed working at my own pace. The feedback was quite constructive. (Teacher 22, Male, USA).*

These two teachers fit what appears to be the dominant learning preference to work on self-paced practically orientated material. Both also had indicated preference to work on their own, but valued contact with others.

*It fitted perfectly with my learning style, as it wasn't just an online course; individual study was required as well, so I had the opportunity to read the materials, work on the tasks in my own rhythm but within some time limits. (Teacher 36, Female, Romania)*

*It was OK, with hands-on, real-life practical activities. I also liked the collaborative activities only that they became difficult due to the different time zones of some participants (Teacher 2, Female, Peru)*

Again, the clear preference is for practical material.

*Practice exercises that were given for participants to complete. This provided a very practical approach to learning. (Teacher 29, Male, Ghana)*

The following teacher had indicated a preference for a traditional classroom type environment, nevertheless, they were able to adapt to the online environment.

*I was able to do the course work, but it did not suit my preferred learning style. (Teacher 32, Male, USA)*

This teacher is highly confident and obviously independent and was able to use the online environment to suit their needs.

*With lot of experience with computers and software there really was no big issue. (Teacher 28, Male, India)*

This is the teacher who commented on their learning preference changing depending on what they were learning. Clearly, the online environment was satisfactory and the teachers first exposure to such a format.

*I enjoyed the on-line course mainly because I couldn't get to a workshop that year and because it was the first experience I had had the chance of doing such a course. (Teacher 33. Male, UK)*

This final teacher comment is included because it provides an insight into one potential advantage of the online environment, that of allowing people who may not be confident in an open face-to-face environment to be able to ask questions and engage more in online discussion and group work.

*I liked the format. It was straight forward and easy to find. The material was managed into chunks with activities. I was able to complete the lessons at any time of the day or night within a specified time frame. Without a time frame, I may have been tempted to leave things incomplete. I enjoyed the collaboration piece more than I thought I would. I'm usually the student who is afraid to raise their hand. It was also very helpful to read the thoughts of new and experienced teachers. (Teacher 19, Female, USA)*

In conclusion, these qualitative comments tend to confirm the classification of the teachers into a group who have a preference for practical, guided material. Added to this is the preference to be able to work at their own pace which may also indicate that the teachers also possess reflective preferences. Many of the comments also indicate the importance of the online teacher in both structuring the course in the first place and being involved in its running. There also do not appear to be gender or cultural differences.

Question 26 asked the teachers to comment on how the online environment did not meet their learning preferences. The qualitative data was again classified into a number of common reasons given by teachers. Fewer teachers responded to this question and a frequency distribution shown below in the Table 4.20.

Code	Description	Frequency
1	Slowness/spontaneous of teacher feedback	4
2	More examples needed, lack of relevance in some.	3
3	Too much reading	4
4	Too few/slowness of postings to forums	4
5	More time needed	2
6	Lack of face-to-face contact	2

#### 4.20 Frequency Distribution for Question 26: How the online environment did not meet the teachers learning preference

There was no one single factor indicated by a majority of teachers. Lack of timely feedback was seen by approximately 10% of teachers as a negative issue. Approximately 10% indicated that slowness of forum postings made it difficult for those who valued discussion. Lack of relevance of some exercises was mentioned by several teachers, and this is aligned with the teachers who saw this as a negative motivation factor. The qualitative comments are instructive and a representative sample is analysed below. These do not necessarily match those of the previous group of students. A selection of comments, specifically relating to lack of contact with the online teacher or with other teachers, is shown below. As indicated in the coding analysis the most common two problems reported were slowness of feedback and restrictions on contact fellow students. Most of the teachers are male and from Anglo cultures, predominantly the USA.

*I found it difficult in that **I couldn't be shown** how to do something directly, and found it slow to get help when I needed some fairly simple guidance or clarification. (Teacher 41, Male, Scotland)*

*It was really a case of not suiting my needs. While I prefer contact with other teachers in the traditional way the on-line course was good as it was what was available for me. Obviously one had to **wait for others to respond** to queries and commentary on the work we produced but hey we were all from different parts of the world, we all had other jobs to do. So understandable really. (Teacher 33, Male, USA)*

*The course was mostly reading and then writing about or using the written material. There was **no opportunity to have a face to face discussion, although there was plenty of opportunity to exchange ideas.** (Teacher 32, Male, USA)*

*The unavailability to **instant feedback** from a tutor as would have been in a class room scenario. (Teacher 29, Male, Ghana)*

*About the only drawback was the **limited participation** by some of the teachers at first. This limited the online discussion and peer collaboration, which is something I really find useful.* (Teacher 22, Male, USA)

*It would have been helpful if **more people** would have **posted their work**.* (Teacher 13, Female, USA)

*It was frustrating that there were **so few postings** from the other participants. I would have liked to have more discussions with them.* (Teacher 7, Female, USA).

***Spontaneous feedback** was impossible.* (Teacher 5, Male, USA)

The highlighted parts of the qualitative comments indicate that a number of teachers found that the slowness in response from either the online teacher or fellow teachers was an issue for them as they preferred the more instantaneous face-to-face workshop environment.

#### **4.7 Comparison of the Quantitative and Qualitative Data on Learning preferences**

The quantitative data tended to suggest that as a whole the teachers preferred to use practical guided learning material that involved some degree of experimentation, for example, whilst learning a new computer programming technique. The quantitative data tended to confirm that teachers preferred to learn using guided practical material. The material presented in LMS tended to support this type of learning strategy.

The data from both sources suggests that the teachers liked to learn on their own, although they also expressed a liking to be able to work with others and also stated a preference to be taught by a teacher. It is reasonable to conclude that, other than possibly a small group of four teachers who clearly indicated a preference to learn with others and to be taught by a teacher, all the other teachers were self directed independent learners who preferred to be actively involved in doing practical activities. It was also clear that being able to work at one's own pace probably indicated that teachers possessed a preference for time to reflect and consider



what they were doing, although none of the teachers specifically made this point in the qualitative personal responses.

#### 4.8 Motivational Issues during the course

In question 28 teachers were asked to indicate if they experienced any dip in motivation during the course. The breakdown is shown below in table 4.21(a). Approximately 50% of teachers experienced some form of motivational dip. The data tends to suggest that the female teachers experienced less motivational issues during the course. The contingency table was analysed using a chi-square test to see if there was any statistical difference between the proportion of males and females responding yes or no. As the Chi-Square Test Statistic of 2.11 is less than the critical value of 3.84 at the 0.05 level of significance with one degree of freedom, it is concluded that there is no statistical difference between the two groups. As a comparison, using Fisher’s Exact Test, a 2-Tailed statistic of 0.208 was obtained, which tested against the 0.05 level of significance, does not provide evidence to suggest there is a statistically significant difference between the proportions of male or females who experienced motivational dips.

<b>Motivation Dip</b>		<b>Male</b>	<b>Female</b>	<b>Total</b>
Yes	Observed	14	6	20
	Expected	11.70	8.29	
No	Observed	10	11	21
	Expected	12.29	8.71	
		24	17	41
		(chi) 2.114122	(df)3.84	

Table 4.21(a): Chi-Square statistic related to Motivation Levels.

The data was further analysed in terms of gender and cultural grouping. This data is shown below in table 4.21(b). A number of cells in the table show values less than 5 and this made using a Chi-Square statistic invalid. The Fischer Exact Test was therefore used.

<b>Anglo-Cultural Grouping</b>			
	Male	Female	
Yes	8	4	
No	7	2	Fischer Exact Test 1 tail = 0.49, 2 tail = 0.60
			<i>No significance difference</i>
<b>Non-Anglo Cultural Grouping</b>			
	Male	Female	
Yes	6	2	
No	3	9	Fischer Exact Test 1 tail = 0.03, 2 tail = 0.06
			<i>Significant at the 1 tail level indicating a potentially significant difference between the motivation dip experiences of male and female teachers.</i>
<b>Indian Cultural Grouping</b>			
	Male	Female	
Yes	3	0	
No	1	4	Fischer Exact Test 1 tail = 0.07, 2 tail = 0.14
			<i>No significant difference, although the 1 tail level is close to the 0.05 level.</i>

Table 4.21(b) Contingency table for difference cultural groupings by gender

The Fisher Exact Test shows that there was no statistically significant difference between male and female teachers from the Anglo cultural group. There was however a statistical difference shown for the non-Anglo cultural group, of which teachers from India comprised 8 of the 20 teachers in the sample. Consideration of the teachers from India showed a partially statistical difference, and at an observation level, 3 of the 4 male teachers experienced motivational problems, whereas none of the 4 female teachers did.

The data suggests that overall a higher proportion of male teachers experienced motivational dips whilst taking the course, however, this difference does not appear to be statistically significant. The Anglo group showed 8 of 15 (55%) males as compared to 4 of 6 (66%)

females reporting motivational dips. The non-Anglo group showed 6 of 9 (66%) male and 2 of 11 (18%) females reporting motivational dips, which was statistically significant, as the difference in the proportions is large. The Indian sub-group showed 3 of 4 (75%) males and 0 of 4 (0%) females. Whilst the differences in the proportions are greater than for the non-Anglo group, the difference was not statistically significant. It should be noted however that the sample sizes are small for both groups and therefore sensitive to small variations in cell numbers. For example, for the Indian sub-group a breakdown of 4 yes and 0 no for the males would have shown a statistical difference – this is a movement of one teacher, and a movement of one female teacher in the non-Anglo group from no to yes would have resulted in a non-statistically significant measure.

Questions 29 enabled teachers to provide qualitative responses to why their levels of motivation varied, and question 30 enabled teachers to provide an indication of what factors aided in maintaining or restoring their motivation to complete the course.

<b>Q29</b>	<b>Factors causing dips</b>	<b>Number of responses</b>
1	not relevant	4
2	stuck solving problems	3
3	completing time demands	7
4	work load of course	1
5	slow feedback	2
6	personal problems	1
<b>Q30</b>	<b>Factors restoring motivation</b>	
1	desire to improve teaching	9
2	material interesting, fast moving, challenging	3
3	Role of Teacher: quick response, supportive	7

Table 4.22: Reasons for dips in Motivation and Factors that aided motivation.

Eighteen out of 42 participants responded to question 29 and 19 responded to question 30. The responses for question 29 were classified into six categories and the responses to question 30 are classified into three categories. The qualitative responses were coded and the results are

shown in Table 4.22 above. The most common reason stated for decreased motivation was competing time demands. Slow feedback was registered by only 2 participants, but it is clear from the responses that a supportive and encouraging online teacher was important in maintaining interest and motivation. In response to question 30 we see a clear indication that motivation was related to an intrinsic self motivation, consistent with research on adult learning, with nine teachers indicating that a desire to improve their teaching was a major motivating factor.

Two of the comments from participants summarise the attitudes:

*It was my second week of online workshop recently held in November 2008 for Java HL Dossier course. During that week, I was unable to solve the programming problems that were given to me. As deadline is approaching, I was so frustrated and I almost decided to leave the workshop that I was doing. Of course, I did send the piece of work that I had completed (with so many errors). Then next day, **online teacher X comes for my rescue** and sends me the corrected version of the program that I need to submit. I was so relaxed and understood the mistakes that I had done. This incident really moved me and inspired me to continue the rest of my workshop most successfully. Not only this, he is always available online, solving everyone problem, sharing ideas and many more. Then I realized that his responses are just like a Bouncing Ball. You throw, it bounces back!! Hats off, teacher X. (Teacher 21, Male, India)*

*At times the workload was daunting however, seeing how other people responded and the difficulties that they were having helped to put it into perspective. The facilitator was encouraging even when assignments were late! (Teacher 15, Female, Ireland)*

The role of the teacher was important in both these teacher's estimations and is the subject of questions 46, 47 & 48 and the analysis of these questions appear later in this chapter.

## 4.9 Comparison of face-to-face workshops and the online workshop

Question 31 asked teachers to compare their experience of doing the normal face-to-face workshop to the online version. Of the 41 teachers, 20 had attended a previous traditional fact-to-face computer science workshop. These workshops are designed to familiarise teachers with the overall requirements of the computer science course. The online workshop mirrors the face-to-face workshop. Notwithstanding the small numbers two different analyses were undertaken. The first involved a qualitative assessment of the responses by directly considering and grouping the responses and categorising into advantages and disadvantages of the online and face-to-face formats – see Qualitative Analysis 1 below. A second analysis was undertaken by coding the responses into two categories: 1 preference for online and 2 preference of face-to-face – see Qualitative Analysis 2 below. This second level of analysis allows gender, cultural grouping and stated learning preference to be considered.

### 4.9.1 Qualitative Analysis 1

Of the 20 teachers who had done both, 8 felt that the main advantage of the online format was that it provided time to work at one's own pace, to reflect and to go into more detail, and to be able to ask more in depth questions. One teacher expressed this as:

*I prefer online workshop over face-to-face workshop, because of simple reasons Online workshop. Strengths You can do this course at your leisure You can study the course material peacefully, refer books, understand the concepts and apply practically with the help of the example programs that are supplied Its a more professional You can participate in the moodle forum and learn many more tips and techniques that are needed to be implemented in your work You can analyze your progress at any point of time You can refer any kind of problems to your workshop leader. Solution is guaranteed on the same day or next morning sharp You can clear your doubts individually (Individual Learning.) No need to travel and waste schools money Weaknesses Nothing Face-to-face workshop Strengths You can see your friends, meet the Workshop leader You can clear your doubts while participating in the group You can attend party and site seeing Weaknesses No personal attention Simply*

*wastage of money over travel and stay Have one certificate and comeback, without proper knowledge. (Teacher 21, Male, Indian).*

Other teachers indicated that the flexibility of online in terms of when the work could be done was a major advantage. This sentiment was expressed as:

*I prefer online experience because I can do it in any time and place when the course is open. (Teacher 35, Female, Lithuania)*

Being able to meet people and to ask and receive immediate feedback on basic questions was seen as a key benefit of the face-to-face workshop by 12 of the teachers who had attended both. Commonly expressed opinions are shown by the following teacher comments:

*The face-to-face workshop provides the opportunity to immediately receive feedback from the instructor and other participants. Often learning happens because of what someone else says or asks as opposed to the material presented by the instructor. (Teacher 32, Male, USA)*

*Face to face was good for script marking and understanding dossier, essay issues. online as better for being able to have time to actually solve full problems according to mastery equipping you better. (Teacher 34, Female, India)*

Three teachers indicated that a key advantage of the online environment was the additional time to digest the material. The following teacher statements convey this:

*Online allowed me to work through the content over a course of weeks. This allowed me to digest the information. (Teacher 13, Female, USA)*

*online is better in that it lasts longer. more time to digest issues, reflect, and feed back. but improved methods for "connecting" remote users are needed. video-conferencing? (Teacher 11, Male, USA)*

*I preferred the online because I had time to formulate questions and really look at what I was being taught. (Teacher 3, Male, USA)*

In the previous section on preferred learning styles none of the teachers had specifically referred to the online environment providing time to reflect and understand things more deeply. The latter two comments give some indication that possibly more teachers who have

indicated a preference to work at their own pace also mean by this that they value a reflective approach rather than simply a practical active approach.

Teachers who responded to this question seemed to divide into those who valued the time to work on one's own, and those who valued being able to discuss and have immediate contact, as expressed by this teacher:

*strengths in face to face: pleasure of meeting people and get to know them. Ask any question that comes into your mind and clarify it straight away. Physically see the resources available and share them. On the other hand, in onLine course, you have got enough time think of one issue where as face to face, time is limited. (Teacher 25, Female, Sri Lanka)*

Only one person expressed equal liking of both formats.

Several teachers commented that a weakness of the online environment was that it was hard to schedule their work load around other commitments, whereas the face-to-face workshop, whilst condensed, reduced the problem of competing commitments. The inflexibility of the workshop format was commented on by one participant, stating that it was difficult to fit the material into the timeframe set aside in the time schedule, whereas this was not a problem in the online format. Few teachers commented on the problem of travel to the workshop.

The following teacher commented on the problem of having teachers in a course who do not have the appropriate background, stating:

*The face to face session did a better job of covering the IB requirements and differentiating the material to reflect the different levels of teachers preparing for IB CS. This is not to say that face-to-face is a better model online. I have developed and taught online classes, and I have had many successful experiences as a student in them. I understand that many of the students in these courses do not have the programming background and their needs should be addressed. The course should either offer differentiation for those of us that teach programming and are experienced with Java, or be clear that the focus of the course is really more for newer teachers. (Teacher 1, Female, USA)*

The level of frustration expressed with lack of levels of difficulty thus catering for different teacher levels of knowledge was not apparent as a systemic problem. However, this problem has now been addressed with the development of introductory level courses, especially for the ones dealing with Java computer programming.

In summary, teachers who had done both modes of PD indicated a key advantage of the face-to-face mode was the ability to ask questions and to receive immediate feedback. This is also consistent with the groups expressed preference to learn from a teacher. These teachers also saw the ability to meet and build professional relationships as another advantage of the face-to-face mode. A number of teachers expressed a key advantage of the online mode was the longer time frame, which allowed for more in-depth understanding to occur because there was time to work on more complex problems. This is also consistent with the groups expressed learning preference for guided practical learning material.

#### **4.9.2 Quantitative Analysis**

The responses were classified into two categories: 1 – preference for online and 2 – preference for face-to-face. This dichotomous categorisation is reasonable as the responses tended to be specific in the preference stated. The categorised data was considered by controlling for gender, cultural grouping and stated learning preference. The categorised data is shown on the next page in Table 4.23. Column 1 shows the category and sub-groups for Anglo culture and non-Anglo culture. The overall totals are broken down into male and female in columns 2 and 3, and column 4 shows the over row total. Hence 8 teachers were classified as preferring online as category 1 and 12 preferred face-to-face as category 2. The stated learning preferences indicate the groups preference for 1: learning on one's own, 2: learning with others and 3: learning from a teacher. The values shown in these columns



represent responses of 4 indicating strongly prefer or 5 indicating very strongly prefer on Question 23 (a),(b) & (d) respectively of the survey.

<b>Online(1) Face-to-Face(2)</b>				<b>Stated Learning Preference</b>		
	<b>Male</b>	<b>Female</b>	<b>Total</b>	<b>1</b>	<b>2</b>	<b>4</b>
<b>ALL 1</b>	3	5	8	6	5	4
<b>Anglo</b>	2	2		3	2	2
<b>Not Anglo</b>	1	3		3	3	2
<b>ALL 2</b>	5	7	12	6	5	8
<b>Anglo</b>	2	2		1	1	1
<b>Not Anglo</b>	3	5		5	4	7

- 1: Learn on own
- 2: Learn with others
- 3: Learn best from teacher

Table 4.23 Categories of preference for online vs. face-to-face.

As noted in the analysis of the learning preference responses the teachers did not respond in a dichotomous way to indicate a preference to learn on one’s own as compared to learning with others. This is again shown in this data. Of the eight teachers indicating a preference for online, six indicated a preference to learn on their own, but six also indicated a preference to learn with others. The data for teacher preference tends to suggest that those that prefer a teacher tend to prefer the face-to-face workshop and those that do not tend to prefer the online environment. Of the group indicating a preference for the face-to-face workshop we see that 8 of the 12 are from non-Anglo cultures and only 4 from Anglo cultures. The 8 preferring online are evenly split between the cultural groupings. There does not appear to be any significant differences based on gender.

In summary, there was a difference between teachers preference for the online workshop vs. face-to-face workshop. There did not appear to be significant differences between the proportions based on gender or culture. Although, teachers from non-Anglo cultures tended

to prefer the face-to-face workshop. Seven of the eight teachers in this group also indicated a strong preference to be taught by a teacher, which would be consistent with preferring the face-to-face workshop, but even though the numbers are small a similar proportion that favoured the online version also indicated a preference to be taught by a teacher.

The first qualitative analysis showed that teachers who preferred the online workshop did so because it gave them time to learn more deeply, whereas the teachers who favoured the face-to-face workshop valued more the immediate feedback and working with other teachers in a traditional face-to-face environment.

#### **4.10 Usefulness of forums**

In question 32 teachers were asked to comment on the usefulness of forums. Question 33 asked how important the contact with other teachers had been.

The majority of teachers, 34 of 41 or 85%, of whom 15 were female and 19 male, found the use of forums to be very beneficial. Of these only one male teacher indicated that they used the forums to see what others had done and did not contribute themselves, *'Did not use the forums except to see what other ideas people had had in response to the same questions'* (Teacher 9, Male, UK). A further two teachers, also male, indicated that their course had low forum postings by other students.

The data was firstly considered in terms of gender and culture and there no obvious discernable trends or associations. The responses were coded as either Yes, to indicate the usefulness of the forums or No, to indicate the use of the forums was not useful to the teacher. The contingency table data is shown below in Table 4.24. The first column indicates the three groups considered. The last column indicates the one-tail Fisher Exact Test statistic. Each of these values is great than 0.05 and thus there is no evidence to conclude that within

each group there is a significant difference in the proportions between male and female and cultural grouping.

Category	Male	Female	Fisher Exact Test
<b>All</b>			0.37
Yes	19	15	
No	5	2	
<b>Anglo</b>			0.34
Yes	12	6	
No	3	0	
<b>Non-Anglo</b>			0.62
Yes	7	9	
No	2	2	

Table 4.24 Contingency table: usefulness of forums by gender and cultural groupings.

The categorical data was further analysed by factoring in the stated learning preferences as indicated by responses to questions 23a (prefer to learn on one's own), 23b (prefer to learn with others) and 23d (prefer to learn from a teacher). The data indicates that teachers who found the forums useful also as a group indicated strong preference to learn on their own – see Table 4.24 below. The second column in Table 4.25 indicated the response, i.e. <3 is a weak preference and >3 is a strong preference. Columns headed 1, 2 and 4 represent totals for Q23a, b & d respectively.

Learning Preference		1	2	4
Yes	>3	24	14	16
	<3	4	12	7
No	>3	6	2	6
	<3	1	0	0

Table 4.25 Usefulness of forums by stated learning preference

Interestingly 16 of the 34 teacher in this category also indicated they preferred to be taught by a teacher, and 14 indicated a preference to learn with others. Further analysis linking gender and culture with learning preference was undertaken but shown no specific pattern.

The survey responses were also considered in terms of why the teachers found the use of forums to be useful to their learning.

Common responses from teachers were:

- See others solutions, suggestions to solve problems, learn from others
- Did not use but viewed
- Enjoyed working with others and comparing
- More contributions than in f-2-f
- Helped me learn, focused on what people were doing and thinking
- Useful but sometime slow in getting postings
- Good for feedback to questions

In particular, the following are representative of teacher's opinions:

*Very helpful. Teachers were great about responding quickly. (Teacher 1, Female, USA)*

*Forums are very much useful. The reasons are given below We can share our ideas We can exchange the material from one another We can start the discussion and continue like a thread I got benefitted mostly from the forums while solving my exercise or otherwise. (Teacher 21, Male, India)*

*Being a member of a team, of a group and sharing materials, knowledge, experience is always a productive experience and it is a chance to increase yourself confidence and self motivation. (Teacher, 36, Female, Romania)*

*I like the forum model. It encouraged me to pay attention to what everyone was thinking and doing. This certainly helped me to learn more from the course. (Teacher 22, Male, USA)*

*I thought they were good, you could see what problems other students were having and then you could see what the instructors responses were. (Teacher 10, Male, USA)*

*The forums were quite helpful. It provided a means for interacting with other members of the group as well as gave the chance to evaluate what one had done based on input from other participants. (Teachers 29, Male, Ghana)*

*The forums were helpful, but with different time zones the responses took time to be received, but other than that the interaction with other learners was helpful I believe. (Teacher 2, Female, Peru)*

These responses from teachers indicate that they valued interaction. Comments included common reference to this aspect: *interaction with other learners was helpful I believe, It provided a means for interacting with other members, being a member of a team or We can*

*share our ideas* (Teacher 28, Male, India). One of the issues raised is the need to be active and to review and contribute to the forums. The experiences tend to be related to the nature of the group, some were more involved or possibly used to the nature of forums and online education. Some teachers did however record negative views.

The following two quotes indicate negative views of the value of forums in the courses:

*The forums attempted to replace the face-to-face interaction. Due to time lags and my schedule, I found them to be of limited value during the course. If I had time to go back and read the threads, I am sure there is plenty of important and useful information there.*  
(Teacher 32, Male, USA)

*I did not get to use them much. It did not seem that a lot of people used them much either.*  
(Teacher 39, Male, Croatia)

These two comments indicate that time needs to be invested to gain the benefit of forum interaction and also obviously that this value is severely limited if only a few are contributing.

There was not sufficient data to be able to determine patterns of which courses exhibited good use of forums and which did not. The LMS user log data could not be accessed for other than three of the courses. From the three courses for which user-log data is available there are 19 teachers, of whom seven completed the survey. These seven teachers are male except for teacher 36. However the data from these logs is instructive and is shown on the next page in Table 4.26. The logs record all user interactions. The column labelled total indicates the number of interactions for each teacher, e.g. assignment submission or posting to a forum. The column labelled form shows the percentage of interactions related to the forums. The comments from teachers 10, 22 and 36 are shown above and indicate a high level of satisfaction with the forums. The workshops do encourage the use of forums and the data shown in the table shows a reasonably consistent rate of interaction with the forums for both workshops, with the exception of Teacher 36 who viewed the forums more often but shows

as a lower percentage rate simply because of the volume of the overall number of actions recorded.

The data for the HL Java for Dossier course conducted in October of 2008 shows a higher percentage rate of forum activity, even though there is little if any work that teachers collaborate on which one might expect may lessen public forum activity. In this case the overall level of activity is much lower when compared to that of the workshop teachers who were much more active. However, the teachers in the sample who took the Java course, for example teacher 21- see comment on page 115, reported very positive comments about the role of the forums.

<b>Workshop 2008</b>			<b>Workshop 2008</b>			<b>Java HL 2008</b>		
<b>Teacher</b>	<b>Total</b>	<b>Forum</b>	<b>Teacher</b>	<b>Total</b>	<b>Forum</b>	<b>Teacher</b>	<b>Total</b>	<b>Forum</b>
N	427	20%	N	413	11%	N	174	24%
10	250	14%	N	537	13%	N	56	23%
N	251	15%	N	273	14%	21	230	40%
N	394	14%	36	1530	8%	9	90	46%
N	390	15%	22	450	16%	38	59	32%
			N	164	12%	N	33	21%
						N	64	31%
						8	44	38%

Table 4.26 Percentage use of forum activities compared to total activities

In summary, a number of teachers found the forums to be valuable as a way of sharing and learning from others. However this was not every teacher's experience with some teachers experiencing some degree of frustration, e.g. related to low usage by other teachers. There was a difference between the level of activity on the workshops as compared to the Java for

Dossier courses. Teachers in the latter course showing significantly less activity overall, but the percentage of forum activity was even higher for this group as compared to workshop forum activity. The group indicating they found the use of forums useful also indicated a strong preference to learn on their own. When considered in terms of gender and culture there did not appear to be any relationship between which groups found the use of the forums to useful and those that did not.

#### **4.11 Contact with other teachers**

Question 33 sought to determine if contact with other teachers occurred and if it was valued by the teachers. The development of a learning community is an aim of the IB's PD programme. Each of the courses made use of forums, and group work was used in the Workshop. There was little or no group work in the SL and HL courses.

The responses to this question divided the teachers into two groups: 26 of the 41 found the contact with others occurred and was valuable, and 11 of the 41 found that contact was limited. The most common reason given was either the course did not promote contact or that time zone problems made contact difficult to initiate or maintain.

Common responses from those who found the contact with other teachers useful include the following:

*Reading their questions helped make some of the assignments easier.* (Teacher 39, Male, Croatia)

*Contact was beneficial, since we were able to help each other. Participants came from all over the world and I felt that there was much more geographic diversity that I have seen at typical IB workshops.* (Teacher 37, Male, USA)

*It was nice to get other points of view and see how others worked their code.* (Teacher 3, Male, USA)

*In the SL course the group work was good but did require an extra effort to wait and chase work from group members also the submission times varied for work as we all worked in different time zones. (Teacher 9, Male, UK)*

*Social contact was not so helpful, but seeing how they worked was helpful. (Teacher 13, Female, USA)*

*Great! Had an insight to how other international teachers juggle their lives, work and home! Meeting deadlines. (Teacher 40, Female, Germany)*

*This was beneficial, but I did find it a little difficult to get used to at first when we were not in the same time zone. (Teacher 19, Female, USA)*

Common responses from those that found the contact of limited value include:

*Contact was not beneficial since so few other participants were posting anything. (Teacher 7, Female, USA)*

*I had low contact with other participants, I had more contact with the course leader. (Teacher 17, Male, Guatemala)*

*I did very little group work during my workshop, basically because of time difference between my group members and myself. However, I believe that it would have served as a perfect platform to get ideas from other members in the group so as to build on my existing knowledge. (Teacher 29, Male, Ghana)*

One aspect to emerge is the notion that the contact did not just happen, but needed work.

Another teacher made the point that ‘*I was unsure when a person asked a question whether I or the moderator should answer it*’. (Teacher 39, Female, Croatia)

Question 34 asked if teachers had maintained contact with fellow participants. Of the teachers who responded, 22 indicated that they had not maintained any contact. Only two indicated that they had maintained contact with other teachers from their courses. Two teachers indicated they maintained contact with the course leader and two other teachers indicated that they made occasional contact via the IB’s Online Curriculum Centre (OCC).

In conclusion teacher contact was seen as valuable by 26 (63%) teachers in the sample, but 11 (27%) report contact was limited often by time zone issues or lack of interactive



involvement of other teachers. There was not a significant amount of ongoing contact after the course had been completed, which is a concern in meeting the stated aim of promoting the development of a PD learning community.

#### **4.12 Impact of course on teaching and value of materials used**

This section deals with the responses to two questions: question 35 and question 36. These relate to how the courses impacted the teachers teaching and how valuable the materials presented on the course were. The materials presented on the courses are a characteristic of the online environment, along with how assessment is undertaken. The online materials are analysed in two ways. In this section the attitudes of the teachers to the different types of materials is determined and in section 4.18 the materials are assessed against a set of criteria developed by the researcher to see how they fit against what the literature suggests as desirable characteristics of an adult online PD environment.

##### **4.12.1 Impact of course on teaching**

Question 35 asked teachers to comment on how the courses had impacted on their teaching.

Only two of the 41 teachers responded in a negative way, one teacher's opinion covered both indicating '*not greatly. the content was not what I was expecting*' (Teacher 11, Male, USA).

The remaining 39 teachers responded positively and indicated a variety of ways that the courses had aided their teaching.

The responses have been categorised and the results shown in Table 4.27. The percentage figure represents the number of times a teachers response mentioned a category. The most common response was that the courses most directly helped in teachers' understanding of the requirements of the Dossier and how to go about presenting concepts consistent with the IB computer science curriculum.

Response	Percentage
Develop better assessments	7%
Adopted Moodle to use with students	9%
Understanding of Dossier & Java concepts	43%
Understanding of Exam	7%
Re-used samples	7%
Learnt how to present material	27%

Table 4.27: Distribution of responses to Question 35.

A number of quotes from teachers are also included to indicate the range of impacts the courses have had on teaching. These indicate the high level of satisfaction expressed generally by the teachers.

*I feel more comfortable supervising my students with their dossier preparation. I also am better at understanding the format and wording of the IB CS exam and therefore I feel that I am constructing better assessments for my classroom. (Teacher, 7, Female, USA)*

*There were some valuable concepts learned and I feel the student Dossiers have been improved because of it, like making the ADT general and not particular to a problem. (Teacher 39, Male, Croatia)*

*I learn more about programming in Java and program design. I got a good teaching experience for preparation for dossier project and everything summarized. Some exercises of the online courses I use for teaching of my students. (Teacher 35, Female, Lithuania)*

*The course has certainly help me to better evaluate the course work and believe and gave an opportunity to understand how colleagues elsewhere evaluated students work. (Teacher 28, Male, India)*

*It definitely helped me in my teaching. I became more confident while delivering lectures on Advanced Data Structures and File handling both theoretically and practically. I am taking help of workshop material that I had done. It was just wonderful. (Teacher 21, Male, India)*

*I feel like I am providing my students better guidance on their dossiers and some additional insight on preparing for the examination. (Teacher 32, Male, USA)*

*It gave me confidence that I knew what I was doing. It provided a great resource for grading and setting timelines for the dossier. (Teacher 19, Female, USA)*

*After taking the Moodle course I researched Moodle as a teaching tool, I (and a few others at my school) now use it for all of my classroom course. These are face to face courses, but all resources/assignments/activities and tests are on Moodle. I believe the use of Moodle has had a positive affect on my students as well as myself. (Teacher 14, Male, UK)*

*Helps me see what skills are "really" important for the dossier and the DP CS course. This helps me to emphasize the "right" things for my students. (Teacher 13, Female, USA)*

*The course gave me a significantly greater level of confidence in my own ability to actually teach and facilitate the course. (Teacher 41, Male, Scotland)*

The qualitative data shows that teachers found the online PD to be beneficial in increasing their confidence to apply the necessary assessment standards. This is an important outcome in terms of meeting the objectives for the IB to increase not only the technical knowledge of teachers but also their ability to apply this knowledge at a high level when teaching.

#### **4.12.2 Usefulness of course materials**

Questions 37 and 38 asked teachers to indicate the usefulness of materials and or activities presented on the workshops or Java courses. Teachers were asked to use the following five point scale: 1: not very useful, 2: occasionally useful, 3: neither, 4: mostly useful and 5: very useful. The results are shown below in Table 4.28. The mean response of the five point scale is shown next to each item.

<b>Workshop Materials/Activities</b>	<b>Mean</b>	<b>Mode</b>
Readings	4.2	4
Script Marking	4.2	4
Dossier Marking	4.4	4
Group Work	3.5	4
<b>Java SL/HL Materials/Activities</b>		
Readings	4.2	4
Reflective exercises	4.2	4
Practical Programming tasks	4.5	5
Dossier simulation project	4.3	4
Group work	3.3	3

Table 4.28 Usefulness of materials and or activities

The overall response by all teachers in the sample was positive about the usefulness of the material provided. The mean and mode are consistently high and the distributions show very few teachers rated the materials as unsatisfactory. The response to group work in both the workshop and Java courses re-enforced the qualitative responses that whilst many teachers valued the group work they were slightly less positive about it in comparison to individual work.

In summary the online PD had achieved its key purpose of increasing the teachers awareness of the standards of assessment required. However, group work was considered slightly less important than the other materials. This reaction is somewhat consistent with the overall group's preference to work on their own or have a neutral preference, but it is also probably a function of the amount of group work required and the level of difficulty some teachers had experienced with undertaking group activities. There were no gender, culture or stated learning preference patterns detected in how teachers responded this question.

#### **4.13 Course format and time factors.**

This section considers the format of the course and when the course was undertaken.

##### **4.13.1 Course Format**

Question 36 asked teachers to comment on the week by week way that the course was presented. The course was not accessible as a whole from the start. Each week was released at the start of the current week. However, teachers did not need to complete and submit assignments before proceeding to the following week once it was made available.

The vast majority of teachers felt the week by week release worked well and gave a focus and clear outline of what needed to be completed within the week. Only three teachers commented that they would have preferred to have access to the whole course from the start to enable them to work ahead (teachers 7, 28, 38). Each had expressed a strong preference to

have access to an overview, but did not express a preference for theory over practical exercises. A number of teachers indicated that the flexible approach adopted by the online teachers helped in managing the assessment demands.

The following is a selection of teacher comments:

*I think the week by week manner keeps the total amount of work to a manageable level, while encouraging students not to fall too far behind. The flexibility shown by the instructor was outstanding.* (Teacher 22, Male, USA)

*This is fine. If the course were less structured, I would probably have gone longer periods without working on the course, missing out on the other user interactions.* (Teacher 32, Male, USA)

*Since most of the other participants did not follow the schedule anyway, I would have preferred to have the whole course available so that I could work more when it was convenient and less when I had other commitments. If the others had been participating, having discussions with them might have made the schedule worthwhile.* (Teacher 7, Female, USA)

*As collaboration with colleagues was one of the components, therefore I believe the week by week methodology was fine, but personally I would have preferred to receive full access to all the resources right from the beginning, in which case I would have read ahead and would have given me more time to ask questions related to topics of relevance to me. Besides personally given the work pressures I would have preferred continuous work over a few days (maybe even taking a few days off from work) rather than the spread the course over many weeks.* (Teacher 28, Male, India)

*I would prefer an open topic-based system. The strict timing (although teacher x was immensely flexible and patient!) did not suit my workload at school, especially given the lack of staff at that point!* (Teacher 38, Male, UK)

These comments highlight the need for a flexible approach on the part of the online teacher, but also indicate that managing the weekly demands is difficult for teachers, especially if no time release is provided by the school.

#### 4.13.2 Time courses undertaken

Teachers were asked to indicate when they had undertaken the work. The data is shown in Table 4.29. Teachers predominantly undertook the courses at home either in the evening during the week or during the daytime on a weekend. Only a small proportion of the course was done at school either in school hours or after school time.

<b>Location</b>	<b>Percentage</b>
At home before going to school	3.32%
During school time	15.30%
After school before returning home	10.34%
Home week day evening	31.81%
Home during day of weekend	26.01%
Home evenings of weekend	13.93%
	100%

Table 4.29 Distribution of when course was undertaken.

In summary the weekly release format of the course was seen by most as appropriate, but some would have preferred to see the entire course from the start. The key issue was the management of the assessment. The weekly release may have made it more difficult for teachers to manage their time as they were not aware of what was ahead. In the HL and SL Java for Dossier courses the major final assignment due at the end of the course was released early in reaction to feedback provided by the teachers.

#### 4.14 Role of the online Teacher

This section analyses data related to answering the second of the two main research questions. This section is divided into five parts. The first analyses the responses to general online teacher practices, the second considers the qualitative responses related to the level of empathy shown by the online teacher, the third considers the effective practices used to maintain interest, the fourth considers practices that aided learning and the fifth looks at

practices used by the online teacher to aid teachers who were not coping with the demands of the course.

#### 4.14.1 Online teacher practices

The teachers were asked to rank the importance of five online teacher practices. Table 4.30 below lists the frequency response and the mean for each of the five practices that are labelled as columns A to E.

<b>Rank</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
1	0	0	1	0	2
2	1	0	1	0	0
3	5	1	9	0	1
4	23	16	18	18	16
5	12	24	12	23	22
N	41	41	41	41	41
Total	162	188	147	190	180
Mean	3.95	4.59	3.59	4.63	4.39
Mode	4	5	4	5	5

1: none, 2: some, 3: neither, 4, important, 5 very important

A: frequency of casual contact e.g. reminders

B: frequency of responses to specific questions

C: Length of response compared to speed

D: Timely feedback on assessment items

E: Effectiveness of responses to problems e.g. code fixes

Table 4.30 Distribution of ranking of online teacher practices

The results are reasonably predictable, and show that each of the factors is equally important with the teachers rating casual and formal contact equally. However it is possible that option C has been misinterpreted, as it tends to indicate that length of response was more important than a speedy response. The data would appear to be inconsistent with other responses, and in the researcher's online teaching experience, where teachers preferred a speedy rather than a detailed response. An observation by the researcher, who also conducted the courses, is that many teachers preferred email one-on-one contact, rather than using public forums. This was probably due to not wishing to be seen not to understand or be able to successfully complete

computer programming tasks in the SL or HL Java courses. It did not appear that this characteristic was related to gender, culture or learning preference.

The responses are consistent with the researcher's online teaching experience, in that frequency of contact and quick responses to specific questions was very important in ensuring that teachers completed the course. This necessitated considerable time and effort on the part of the online teacher. Typically there were on average 5 to 9 teachers on any course, and mostly these were in different time zones. Because of differences in time zones teachers could become frustrated with the online teacher if responses were not received within 8 to 10 hours. This was especially true of problems associated with computer programming questions.

#### **4.14.2 Level of online teacher empathy**

In question 46 the teachers were asked to comment on the importance of the empathy shown by the online teacher. The vast majority of teachers (35 of 41 or 85%) indicated that the empathy shown by the online teacher was important. A number of teacher quotes are listed below. These are selected as representative across gender and culture, and express similar sentiments.

*I was very encouraged by the level of understanding that the facilitator provided. His approach towards correcting my errors and dwelling more on my strong points provided excellent encouragement. (Teacher 29, Male, Ghana)*

*I definitely put on a record the kind of help and support that I had received from my workshop leader. He is very quick, understandable, easily approachable to the queries that I made personally. As mentioned earlier in Q.29, he came to my rescue when I was frustrated and about to leave. What I could observe during the course was, he takes care of each participant, value their work, give suggestions as how to go about in future. As a participant, what else I want? (Teacher 21, Male, India)*

*helped with course problems -understood that the participants work and devote to the course and development what's left of their free time -encouraged to contact. (Teacher 4, Female, Poland)*



*It is very important, the instructor gives you self confidence and you feel that you are not alone.* (Teacher 20, Female, Mexico)

*Obviously very important as it is easy for on in my situation to feel very isolated and lacking support.* (Teacher 41, Male, Scotland)

*One suggested: As I said, I feel there should have been more feedback. But then again, I took the first course.* (Teacher 31, Female, USA)

These comments indicate clearly that it is extremely important for the online teacher to be positive and empathetic to the needs of the online learner. The teachers have indicated that the following characteristics of an online teacher are important:

- dwelling on strong points
- being quick and understandable
- taking care of each participant
- valuing their work
- encouraging contact
- developing a feeling of self confidence
- helping overcome potential feelings of isolation

#### **4.14.3 Effective strategies used by the online teacher to maintain interest**

Question 47 asked teachers to comment on the most effective ways the online teacher assisted to maintain their interest. The teacher comments were categorised and the results are shown on the next page in Table 4.31. This question provided the teachers with an option to offer a qualitative comment, and to allow some consistency checking with the question 45 which simply presented the teachers with options of good practice which they ranked. Not all teachers responded to this question, but of those that did 21 indicated that timely and accurate responses with appropriate detail was the single most important strategy used by the online teacher which maintain their interest.

<b>Online teacher strategy</b>	<b>Frequency</b>
Positive/appreciative/encouraging	4
Knows material	1
Variety and interesting design and materials/relevant	7
Timely response & detailed & accurate	21
Honest feedback	1

Table 4.31 Effective online teacher strategies

Again there does not appear to be any gender or cultural effect. Of the 21, 10 were male and 11 female, 12 were from Anglo cultures and 9 from non-Anglo cultures. There appears wide spread agreement as to what constitutes good practice in maintaining teacher interest. The qualitative response indicates clearly that timely feedback is the single most important strategy that helped maintain teacher's interest. This also accords with the experience of the researcher who also taught the courses. Teachers responded well to email contact. The contact seemed to be valued by the teacher's, however the style of contact needed to be one of encouragement. In circumstances where teacher's might be complaining about some issue it seemed to be very important to adopt a responsive and encouraging tone in any subsequent email contact. Teacher's often did not respond to email requests for updates on how they were going and hence additional follow-up contact was necessary. The key issue here is that it was important not to simply cease contact, but to be persistent.

### **Best practices that aided learning**

Question 48 was worded slightly differently, and asked teachers to outline the best practices followed by the online teacher and how these assisted their own learning. The intention was to again provide teachers with the opportunity to provide a qualitative comment. The comments are summarised below and a range of direct quotes follow.

Key points raised were as follows:

- Feedback, positive and encouraging.
- Knowledgeable comments
- Materials relevant, real life to course, encouraged exploration – active involvement. Directly relevant. Knowing how to mark dossier.
- Facilitator took active part in discussions, moderation to keep us on track.
- Acknowledged input, coached, communicated with all, individual focus.

Some quotes:

*Constant support positive feedback good materials and examples. (Teacher 9, Male, UK)*

*They got back to me in a timely manner and answered my questions or let me know if I did an assignment correctly or if I missed the point. (Teacher 10, Male, USA)*

*He followed the real life scenarios, that had worked very well to my learning. Without which perhaps, I might had struggled in understanding some of the topics in Higher level computer science. (Teacher 21, Male, India)*

*The instructor used reflective questioning very well to get me to consider different perspectives. The instructor was also good at explaining specific details which had to be considered. The feedback was encouraging and constructive. (Teacher 22, Male, USA)*

*Prompt response to questions as well as timely review of assignments that were submitted. A very understand approach towards not meeting of deadlines as well as constructive comments on the assignments submitted. (Teacher 29, Male, Ghana)*

*It is very good idea to publish material and examples how tasks should be done when a deadline ends. (Teacher 35, Female, Lithuania)*

*Case studies have been very interesting and helpful- most of them can be successfully developed with students in my classes. (Teacher 36, Female, Romania)*

*Was persistent...and very helpful and understanding. (Teacher 38, Male, UK)*

*Commenting on submitted solutions: good or bad. (Teacher 39, Male, Croatia)*

*Liked the 'ice breaker'. Did not assume prior knowledge of Moodle so helped us with the navigation aspects. (Teacher 40, Female, Germany)*

*Suggesting useful solutions to problems I posed, and having working examples of code as models. (Teacher 41, Male, Scotland)*

Only three teachers provided slightly negative comments including, *“Nothing to report, no idea, I can't remember any good advice”*. (Teacher 32, Male, USA)

The comments from teachers are consistent with the responses to the previous questions about the role of the teacher. The comments indicate that a proactive role is desired and that

constant feedback and responses are vital to ensuring successful completion and for learning to occur. There was also common agreement across cultures and between genders.

#### **4.14.4 How the online teacher responded to problems of not coping**

The final question relating to the role of the teacher concentrated specifically on what the online teacher did to assist teachers who were not coping with the pace of the course or the time constraints, for example, on assignment submission.

Question 49 asked: 'Did you fall behind, comment on your feelings and how you were able to catch up.' Nearly 60% (24 out of the 41) teachers reported no major problems, 24% (10 out of 41) reported experiencing problems coping, with a further 7 teachers indicating that whilst they experienced some time demands they felt they coped well and did not fall behind. The major reason for falling behind was conflict with other time demands. One teacher who received time release from their school explained:

*I was given release time by my school board, so I didn't fall behind, the release time was very important to me. (Teacher 14, Male, UK)*

Teachers who experience problems expressed feelings of being overwhelmed or disappointed that they could not meet deadlines. The following comments indicate the attitudes and feelings of those who experienced problems.

*I don't think that I fell behind deadlines but came close to it. I was able to catch up quickly based on my school workload. I did feel stressed to keep up, but I tend to let things go until the last minute. (Teacher 19, Female, USA)*

*A little overwhelmed - although the pressures were external to the course. A large amount of prioritisation was needed. (Teacher 27, Male, UK)*

*I asked for more time and they gave it to me, then I was able to find time to catch up. (Teacher 10, Male, USA)*

*yes due to time constraints. I had to spend a lot of time at home to catch up with the work. and used to e-mail facilitator and other participants for more clarifications. (Teacher 12, Female, Pakistan)*

*I was late on some week assignments because the work on my school, but they gave us the chance of give the assignments on the week after it was programmed to be completed, so I could continue the workshop and still be motivated to continue it. (Teacher 17, Male, Guatemala)*

*The instructor understood very well everything and gave some tips to go faster in my learning. (Teacher 20, Female, Mexico)*

*The nature of the non-linear environment makes catching up easy but being disconnected from a face-to-face class made it easy to get behind. (Teacher 26, Male, USA)*

*I was frequently behind. I really wanted to take the course, but the time offered conflicted with a really busy time at school. Catching up was always difficult for me. (Teacher 32, Male, USA)*

*I felt very disappointed. I got some extension of the deadlines but I still could not meet them. It was obvious that the program had accommodated me enough but I couldn't just find the time to meet the requirements. (Teacher 26, Male, USA)*

*Communicated with the person I was working with - we managed to get it all done. Email was useful as a communication tool with individuals. (Teacher 40, Female, Germany)*

*frustrated. I tried to find out what was essential to meeting assessment requirements and do these first when time permitted. (Teacher 41, Male, Scotland)*

Again the role of the online teacher was important in understanding the time pressures and making allowances, e.g. extending deadlines. Time release was valued by a small number of teachers as an important way the school supported their involvement. Some teachers expressed feelings of frustration, due mostly to outside competing pressures on their time.

Of the 10 teachers who expressed problems coping 7 were male and 3 female, of the 7 males, 6 were from Anglo cultures. This is consistent with data on motivation outlined earlier in section 4.8 where more males than females were observed to experience motivation dips, although this difference was not statistically significant.

#### 4.15 Cultural Issues reported by teachers

Question 51 asked teachers to comment on any cultural issue they encountered. Other than three teachers indicating that language could be a potential problem there were no problems raised by any of the teachers from the non-Anglo cultural groupings.

#### 4.16 Teacher perceptions of important characteristics of online Professional Development courses.

Question 50 asked teachers to respond to seven statements to indicate the importance of these features in an online professional development course. Teachers were asked to rank seven statements using a five point Likert scale. The distribution along with the mean and mode of these responses is shown below in Table 4.32.

<b>Important Characteristics of online PD</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Mean</b>	<b>Mode</b>
Tasks clearly stated and practical	0	0	0	11	30	4.73	5
Tasks focused on facts and information, limited use of activities	1	7	13	10	10	3.51	4
Tasks presented in a controlled and sequential manner	0	0	4	18	19	4.37	4
Some tasks enable me to explore and experience uncertainty.	0	5	5	20	11	3.90	4
Tasks directly relevant to my teaching.	1	0	1	6	33	4.71	4
Tasks that include reflection that allow me to think deeply about how I would approach my teaching.	1	1	3	12	24	4.39	4
Tasks that enabled me to share my understanding with the others.	1	0	8	15	17	4.15	4

Table 4.32 Distribution key features required in an online professional development course

The responses indicate a strong preference for each of the seven characteristics. A small number of teachers indicated that it was not important to have tasks that allowed them to

experience uncertainty. The responses tend to indicate that the small sample of teachers valued what would be considered as essential characteristics of a PD programme that sought to actively involve the learner in exploring, creating and sharing their knew knowledge. Teachers indicated they valued both clear and practical tasks, related to their teaching that also allowed them to gain a deeper understanding, with the ability to share their knowledge with others. These preferences are consistent with the design of the online courses and with the requirements of the IB for professional development.

#### **4.17 Future developments in Assessment**

The assessment for any of the three online courses is based on the completion of at least 80% the assessment items and whilst assessment is an important characteristic of an online environment it was not specifically consider in this study. However, the IB is keen to develop a more sophisticated assessment model, which seeks to assess the level of involvement and degree to which the participants develop in-depth understanding. Whilst this is not specifically related to either research question as it deals with what might occur in the future, it did elicit a polarised view from the small sample of teachers, which did not appear to be related to a stated learning preference. There appears to be a binary split between participants who want assessment, and those who are not motivated to do the course for a certificate but instead to learn from the course. The results of the analysis presented here tend to suggest that the form of assessment in PD is a possible area of tension for teachers, with some preferring competitive models, whilst others prefer less competitive models.

Question 52 asked the teachers to indicate how they felt about four statements related to assessment. The results are shown in table 4.33 on the following page. Teachers were also able to provide a comment and selected ones are shown below.

<b>Statement</b>	<b>Yes</b>	<b>No</b>	<b>NA</b>
1. There should be a summative assessment	54%	33%	13%
2. All assessment should be graded rather than some just being noted.	33%	49%	26%
3. An acceptable level of participation is necessary in group work or discussions	56%	23%	21%
4. Participants need to show a good level of reflection and critical thinking	56%	18%	26%

Table 4.33 Attitudes to forms of Assessment

The data suggests that a model based on a summative assessment and the valuing of participation is favoured by 50% of the teachers sampled. However a smaller proportion (33%) of teachers would not like to see summative assessment used. A smaller proportion didn't favour the need for assessment of either participation or level of in-depth understanding achieved.

There appeared to be no specific relationship of attitudes expressed in relation to gender or cultural background. In respect of summative assessment slightly more non-Anglo teachers (59%) were in favour, whereas they comprised only 48% of the sample, and of those in favour 52% were male, whereas they comprised 59% of the overall sample. Of the teachers that did not see the need for a summative assessment 67% (10 of 15) were from Anglo countries and 33% (5 of 15) from non-Anglo countries. These proportions are not statistically significant using a Fisher Exact Test but do potentially indicate that there may exist a cultural bias against the future use of summative assessment in online PD.



Some feedback from teachers in favour and against the need for summative assessment is outlined below.

### **Assessment not needed**

*I don't believe there is a need for a summative assessment or other formal assessment criteria. Teachers who participate in the process and complete the assignments on time have gained an understanding of the material to improve their courses. There is no need to burden either the instructor or the participants with formal assessments and "grades". (Teacher 32, Male, USA)*

*I don't think that a summative assessment task is appropriate for a professional development class such as this. It adds too much stress without much real value. I think that #3 and #4 are the most important factors. If participant actually participates and demonstrates a good level of reflection and critical thinking, he or she will most likely be able to effectively teach IB computer science. Largely because the participation and reflection will demonstrate the capacity to learn the new things that come up in teaching any new class. (Teacher 22, Male, USA)*

- 1. I don't think that a summative assessment task is necessary or desirable.*
  - 2. I think that this would be an improvement for at least some of the tasks, but completion is fine for others.*
  - 3. Yes, this would help the quality of the course a lot.*
  - 4. Yes, I think pushing people to be reflective and think critically increases their learning.*
- (Teacher 7, Female, USA)

### **For assessment**

- 1. There should be a summative assessment task. I took the workshop, I don't feel the added 'pressure' of a marked assignment is useful, participants get out of a course what they put in, yes there needs to be evidence of completion/participation, after all it's a course.*
  - 2. All assessment items should be graded rather than just noted as done or not done. See above, grades not relevant, feedback is though, particularly feedback on how to improve, provision of exemplars.*
  - 3. An acceptable level of participation is necessary in group work or discussions. Yes, when I took my course there was a 'pairs assignment', my initial partner was 'nowhere to be found', this was frustrating as I could not proceed myself.*
  - 4. Participants need to show a good level of reflection and critical thinking. Yes, I think that a workshop is for learning by doing, grades are not important, but reflecting on what we have learned and how to improve is the most important outcome. Sharing of these thoughts is particularly important.*
- (Teacher 14, Male, UK)

*All assessment items graded as done or not done was good enough. An acceptable level of participation is necessary otherwise always having only one or two peoples' contribution.*

(Teacher 25, Female, Sri Lanka)

Those who don't see the need for summative assessment seem to indicate that learning takes time, and a summative item would not necessarily be a good indicator of what has been learnt on a PD course. The two teachers quoted above who are in favour of more formal assessment seem to be concerned about how group work is assessed, and see that an individual summative item would overcome this problem.

#### **4.18 Analysis of features of the online courses**

A checklist of criteria has been constructed by the researcher as a way of analysing the pedagogical design of the Computer Science online learning environments against what the literature considered to be characteristics of well designed online environments. It is also used to determine whether the online course design meets the criteria specified by the IB for online PD.

There are two sets of criteria. The first lists criteria that should be met in terms of learning features, whilst the second lists criteria that should be met by the assessment items. The checklist was applied against each of the three online PD courses. The results of this assessment are outlined below under the headings Workshop Assessment, SL Java for Dossier Assessment and HL Java for Dossier Assessment. The checklist is shown below in Figure 4.1.

##### **Learning features checklist**

The design of the online material meets the following criteria:

1. material presented is directly relevant to the professional needs of the teacher;
2. training is available on how to use the online learning management system;
3. teacher material/structure facilitates active involvement rather than simply providing information;
4. teacher is able to direct their own learning and work at a pace and sequence that suits them and
5. teacher material/structure facilitates active discussion and collaboration with fellow participants.

##### **Assessment features checklist**

The assessment items enable teachers to:

1. develop critical understanding by providing authentic and challenging items that are directly relevant to the needs of the teacher and
2. be able to construct, question and reflect to enhance their own understanding.

Figure 4.1 Learning and Assessment features checklist

The criteria set out in Figure 4.1 are now applied to each of the workshop and the two Java courses.

This analysis is important in order to see if the course design fits with the aims of the IB PD policy and to see if there are any inconsistencies with the attitudes expressed by the teachers to what would be considered good pedagogical design elements.

#### **4.18.1 Workshop Assessment**

##### **Learning features**

The design of the online material meets the following criteria:

1. *Material presented is directly relevant to the professional needs of the teacher.*

Yes, the material is directly relevant and covers key aspects of the course, e.g. dossier criteria, dossier mastery factors, examination and marking, extended essay and case study. Teacher feedback has confirmed this.

2. *Training is available on how to use the online learning management system.*

Limited training material is available. There is an assumption that teachers have used a learning management system (LMS) or adapt quickly and for the most part this has proved to be the case, but there were some teacher who expressed concerns about the ease of use of the LMS used. There is an introductory reading and also an online tutorial available on how to use the Wiki.

3. *Teacher material/structure facilitates active involvement rather than simply providing information.*

Yes, the material seeks to reach a balance between simply transmitting information by reading and engaging in activities that seek to actively involve the teachers, e.g. group marking exercises, exam writing and dossier timeline plan. The teacher feedback confirms that most teachers want practical material that actively involves them. There

was no feedback from teachers that suggested they simply wanted to access just reading based material.

4. *Teacher is able to direct their own learning and work at a pace and sequence that suits them.*

To some extent teachers are able to request additional information. The structure and content of the course is reasonably fixed. There is a degree of flexibility provided on the due dates of assignment, which allows teachers to work more at their own pace rather than the week-by-week pace. There is only limited ability for the teacher to change the sequence of the course. There was no specific feedback provided by teachers wanting to be able to have more control over the direction, content or mode of assessment.

5. *Teacher material/structure facilitates active discussion and collaboration with fellow participants.*

Yes, there are a number of group exercises that facilitate collaboration. The feedback on the use of forums was positive and despite the time zone difficulties the collaborative marking exercises were seen as useful.

## **Assessment**

The assessment items enable teachers to:

1. *develop critical understand by providing authentic and challenging items that are directly relevant to the needs of the teacher.*

Yes, the course provides realistic and authentic assessment tasks that are directly relevant to the needs of the teacher, e.g. exam question development, exam script marking and dossier marking. The intention is that these enable teachers to build a critical understanding but it is the researcher's assessment that more specific reflective and critical analysis tasks need to be added to fully meet this criterion. The feedback from teachers shows that it is important to meet the practical needs of the

teacher. There is some level of disagreement amongst the teachers in this small sample as to how the assessment of ‘critical awareness’ would be done in future courses.

2. *be able to construct, question and reflect to enhance their own understanding.*

Yes, despite the course being structured there is opportunity for teachers to question, either via email or by use of public forums in the LMS. There is also some opportunity to reflect on their learning but more could be done to improve this aspect. The assessment tasks focus on involving the teacher not just passively reading and answering comprehension style questions, e.g. script marking, developing timelines, developing exam questions. Teacher feedback suggests that they valued the assessment items and the ability to question the online teacher.

The course design does meet most of the criteria. The material seeks to involve teachers but self direction is somewhat limited. Given the nature of the course this is possibly acceptable. One aspect which does appear to need addressing is to provide more opportunities for teachers to reflect and demonstrate more critical awareness. This is also an aspect that the IB is looking to focus on with the proposed new assessment criteria for the award of a certificate. The feedback from teachers in general is supportive of these design features, although it is not clear how future assessment of ‘critical understanding’ is to be done. One aspect that is taken up in the next chapter is the issue of education on how to use online learning.

#### 4.18.2 SL & HL Java for Dossier Assessment

Both courses are considered together as the design for each is almost identical.

##### **Learning**

The design of the online material meets the following criteria:

1. *Material presented is directly relevant to the professional needs of the teacher.*

Yes, the material is clearly focused on practical learning that is directly related to the professional needs of the teacher, e.g. learning Java programming concepts related to teaching students to gain mastery factors for the dossier and also simulating the dossier process. Teacher feedback on this area was positive.

2. *Training is available on how to use the online learning management system.*

Limited training material is available. There is an assumption that teachers have used a learning management system (LMS) or adapt quickly and for the most part this has proved to the case. There is an introductory reading and also an online tutorial available on how to use the Wiki. Teachers did not provide feedback requesting more than was provided.

3. *Teacher material/structure facilitates active involvement rather than simply providing information.*

Yes, the design of the course facilitates active involvement, there is some straight provision of information, but always this is linked with active programming tasks.

The teacher's feedback suggests that the nature of the materials did facilitate individual active involvement.

4. *Teacher is able to direct their own learning and work at a pace and sequence that suits them.*

There is limited scope for this in the current design. Teachers are asked to request further material to be covered that more suits their needs, but this is rarely requested. A sequential movement through the weeks is standard, and the only way that teachers can slow the pace of the course is by not submitting on time, this is usually done with agreement of the online teacher and has the effect of enabling the teacher to work more at a pace that suits them. Teachers did not indicate that they wished to direct their own learning but did indicate some flexibility in being able to work at their own pace was desirable and that this was a key advantage of the online environment as compared intensive face-to-face short courses.

5. *Teacher material/structure facilitates active discussion and collaboration with fellow participants.*

This is a short coming of the current design. There is scope for collaboration but it is not specifically designed into the course.

## **Assessment**

The assessment items enable teachers to:

1. *develop critical understand by providing authentic and challenging items that are directly relevant to the needs of the teacher.*

Yes, the researcher believes that the current design achieves these objectives. The assessment is practical and deals with authentic problems, the main assignment involves a real-life situation where the teacher gains firsthand knowledge of the problems involved in doing the dossier. The teacher feedback on the relevance of the main assessment item referred to above is supportive of the importance of this objective.

2. *be able to construct, question and reflect to enhance their own understanding.*

Yes, these features are designed specifically into the assessment items. For example, the final assignment asks for a detailed reflection on what has been learnt. The final assignment allows learning to take place by constructing the dossier from the point of view of the student; rather than simply guiding the student the teacher has developed their teaching strategies by actually experiencing the issues the student will experience during the development of the dossier. The role of reflection in the assessment of the Java courses was seen by researcher, who designed the courses, as important and the teachers mostly provided well constructed reflections.

The course design for both Java courses meets most of the objectives other than providing opportunities to formally collaborate, and there is limited scope to fully direct one's own learning. Teacher feedback is consistent with the majority of the criteria.

#### **4.18.3 Comparison of IB PD course objectives with the criteria and the online courses**

The objectives of the IB PD's programme were outline in Chapter 1 and are re-stated here.

The following analysis relates these objectives to the criteria developed by the researcher and the design of the online courses to see if these are consistent.

*(vi) Develop the workshop community's ability to adapt – encourage participants to help shape the objectives and design of workshops*

Learner self direction has been shown to be lacking in the designs of the current courses however there is scope for teachers to feed in suggestions for future developments. This objective is partially meet by the ongoing course evaluation. As part of the overall system of IB PD the current course design facilitates the collection of information to enhance future courses in Computer Science. The online courses do meet the need to increase the adaptability of the community of Computer Science teachers. Courses can be developed quickly and to meet needs as they arise, e.g. a new Introduction to Java and the New



Criteria Explained are two new courses which demonstrate the flexibility of the online format.

(vii) *Link information to action – encourage learning by doing*

This objective relates directly to the Learning and Assessment criteria which place an emphasis on active learning. The online courses have also been shown to satisfy this objective.

(viii) *Provide opportunities for coordinated action – utilise collaborative activities;*

This objective relates to learning criteria 5 above. The workshop meets this criterion fully but there is room to develop the use of collaboration more in the Java courses.

(ix) *Improve access to knowledge – enhance access to knowledge teachers need.*

This is more a system level objective, the course does meet this by providing access to information and contact with expert online teachers.

(x) *Harvest knowledge in repositories – enable development of online knowledge resources.*

There is potential for this to occur by inclusion of Frequently Asked Question lists (FAQs) and the like but currently this is not a design element of the online Computer Science courses. The IB's Online Curriculum Centre (OCC) is widely used and potentially a link between the online PD courses and the OCC could be established to enhance the distribution of knowledge gained via the online courses.

This analysis of the comparison of the IB objectives for the learning and assessment criteria developed by the researcher for the online courses, shows that these are consistent with each other, especially in the area of actively involving teachers, i.e. IB PD objectives (i), (ii) and (iv). Criterion (iii) is addressed by the online workshop but more needs to be done to enhance this aspect of the Java courses and the linking of the OCC with the online PD courses is a potential way to address criterion (v). There is limited capacity for the teachers to self direct their own learning. The next chapter outlines the results of the analysis and clearly relates these to the research questions.

## **Chapter 5 - Results**

In this chapter the overall results of the analysis are presented. The results are presented in four sections:

Demographic of the sample

Research Area 1 and associated research questions;

Research Area 2 and associated research questions and

Assessment of the online design.

### **5.1 Demographics of the sample**

The analysis showed that the sample was reasonably representative of the population of teachers that had undertaken the PD. Table 4.1 showed that the sample comprised 41 teachers, which is approximately 40% of the number of teachers who had done the PD. The sample was comprised of 59% male and 41% female, compared to the population proportions of 69% and 31% respectively.

The geographic location of schools from which the teachers in the sample taught at is shown in table 4.3. This showed a wide geographic spread of schools based on the GLOBE (Gupta et a. 2002) classification. The most dominant being the Anglo grouping of countries represented by USA, Canada, Australia, UK and NZ, of which the USA represented the largest group. When the cultural background of the teachers was considered teachers drawn from the Anglo country grouping were the most dominant representing 21 of the 41 teachers in the sample, of this group 13 teachers were from the USA and these teachers all taught in USA based schools.

The next largest non-Anglo groupings of teachers came from the following countries: India-South Asia (8), five from Eastern European Countries (5) and four from Latin America (4).

This breakdown of cultural and geographic background is reasonably consistent with the enrolment data shown in table 1.2, which shows that the USA has approximately 50% of enrolments and that India and Europe/Africa/Middle East have shown a small increase. Hence we would expect that these areas would tend to be represented in these proportions.

In summary, 21 (51%) of the teachers came from Anglo background and 20 (49%) of teachers came from non-Anglo cultures. The teachers were experienced with an average of 14 years teaching experience and were all tertiary qualified.

## **5.2 Research Area 1**

**Research Question 1:** *How did teachers respond to different aspects of the online learning environment?*

### **Q1.1 Experience starting the course and using the LMS**

The majority of participants found the LMS easy to use, even with only 17% of teachers indicating they would classify themselves as experienced users of online education systems – see table 4.7a. A very small number of teachers indicated some difficulty navigating the site at the start. However, the initial wiki introductory exercise set in the week before the course started seems to have served the purpose of giving the inexperienced teachers time to become accustomed to using the features of the LMS. The analysis of the learning environment against the criteria developed by the researcher does indicate that more could be provided in terms of the how to use an online learning environment. No training was provided in this regard.

There were no differences in reactions to the ease of use of the LMS based on cultural groupings, gender or groups based on gender and culture.

The presentation of the course in a staged release manner suited most participants, or at least did not cause problems. A few participants indicated that they would have preferred to see the entire course but that this was not a strongly held preference, and only one of the four teachers who had indicated a theoretical learning preference stated, “No, I would've rather had all the assignments opened at once” (Teacher 10, Male, USA). Only one teacher indicated considerable dissatisfaction with content of the course, stating the course did not address what they had expected.

### **Q1.2 General issues of motivation**

A number of teachers did express problems with motivation to continue with a course at stages throughout the course: 21 teachers reported this problem, of whom 14 were male and 7 female. These were mostly associated with the pressures on their teaching functions caused by competing family commitments. However, the teachers in the sample all completed the courses and dropout rates in general were very low, less than 10%. The role of the online teacher proved to be crucial in supporting the teachers during these times. There did not appear to be specific cultural or gender based issues related to motivation, although more males in both the Anglo and non-Anglo groups experienced motivational dips. There was a statistically significant difference found for the non-Anglo group of males but this statistic would appear to be potentially unreliable because the difference was not found to be significant when male Indian teachers were considered separately. It is possible that there is a cultural effect here, in that three of the four male Indian teachers expressed a strong preference to be taught by a teacher and were possibly not used to working on their own without direct recourse to a teacher. Each of these teachers indicated that the support of the online teacher was vital in assisting them complete the course. However, with such a small sample a more definitive claim cannot be made other than to suggest that the attitudes are

possibly more a function of lack of familiarity with online environments than to do with any gender or cultural aspects.

### **Q1.3 Comparison of face-to-face workshops and online**

Nearly 50% of respondents had experience of attending an equivalent IB face-to-face workshop. Being able to work at one's own pace and at any time was seen as a major advantage of the online courses. Teachers who had attended a face-to-face workshop divided between those that expressed a preference for this format and those that preferred the online mode. Being able to meet others and to get immediate feedback on questions was seen as the advantage of the face-to-face mode. Whilst being able to work at one's own pace and hence have time to think more deeply about the work was seen as the main advantage by those that favoured the online mode, indicating that it may be misleading to conclude that reflection was not a preferred learning preference.

### **Q1.4 Usefulness of forums and Q1.5 Contact with other teachers**

Again there were no differences between how teachers viewed the role of forums and contact with others on the course. The vast majority of teachers found the use of forums to be beneficial. A common comment was *"this was beneficial, but I did find it a little difficult to get used to at first when we were not in the same time zone"*, (Teacher 19, Female, USA). An observation from the researcher is that the use of forums tended to be less interactive between the participants and more a way to formally communicate with the online teacher. Email was also heavily used as a means of one on one communication between the teachers and online teacher.

One related aspect to emerge is the notion that the contact between teachers did not just happen, but needed work. As one participant put it *"I was unsure when a person asked a question whether I or the moderator should answer it"*, (Teacher 39, Male, Croatia). The

courses were of a short, four to five week duration and it was the first online learning experience for many of the teachers. It was also the first set of courses that the online teachers, including the researcher, had conducted. The analysis of the course materials also reveals that more collaborative activities need to be added. But given the feedback from teachers that time zones differences can create problems, simply adding more collaborative tasks might be counter productive and have the potential to increase the frustration level of teachers. One aspect that needs to be considered here, and is possibly related to the lack of any training, is how to increase the amount of interaction within an online environment. As noted above, interaction does not just happen. The analysis of the online materials found that only limited training is provided and what is provided is reasonably basic, much like a quick start guide you would expect to be supplied with software. Both the participating teachers and the two online teachers were initially inexperienced with the use of online education and it maybe that an assumption was made that, given the teachers are computer science trained and familiar with computer environments, interaction would occur by default and that teachers would already be familiar with time zone issues. It is likely however that many of the online teachers needed to be much more proactive and supportive in the initial stages to foster collaboration, and that teachers need more direct training on what to expect, and how to effectively interact with each other to enhance the collaborative aspects of the course.

Most teachers reported that they had not kept in contact with fellow participants after the course. In terms of developing a community of practice this is a concern.

### **Q1.6 Impact on teaching**

The online PD was well received by most of the teachers, with only one teacher indicating the content was not what they were expecting. The qualitative data showed that the PD improved teachers understanding and confidence delivering the course IB Computer Science

courses. This is an important outcome as it meets the IB's aim of increasing not only teachers' knowledge but being able to apply this knowledge to improve student outcomes.

### **Q1.7 Usefulness of course materials and assessment items**

The majority of teachers who took either the workshop or one of the Java courses found the material provided to be useful. The group work in the workshop was found to be slightly less useful than the written materials, and this was also the case in the Java courses where far less group work was included. The analysis of the learning environment indicated that more collaborative tasks needed to be included to meet one of the desirable characteristics of an online learning environment. Teachers commented that whilst collaboration was valuable, the online environment presented time zone problems which tended to limit effectiveness. The learning materials presented met the other characteristics of what the literature suggests are required by adult learners, and certainly sought to engage and actively involve the learner in practical work directly related to teaching the computer science course; a number of teachers indicated that they made direct use of the materials to improve their teaching in class. Clearly a major factor in the success of the courses has been the perceived use the teachers could make of the materials presented. Only one teacher commented that the materials were not appropriate.

### **Q1.8 Attitude to the IB's proposed changes to Assessment.**

The current mode of assessment is based on completion of 80% of the assignment activities. The assignments are not graded and no summative assessment item is used. In response to a question about the future role of assessment, teachers expressed polarised views. Some favoured the use of a summative assessment and the grading of work, including group work, but others did not favour this style of assessment and commented that they did not see why PD needed to be assessed. The IB is keen to assess the level of engagement and also the

degree to which teachers demonstrate high levels of reflection and understanding. Based on this small sample a proportion of teachers, approximately 20%, may not be keen to participate in PD assessed in this way. The attitudes were investigated by gender, cultural groups and learning preference and no specific differences were found.

The results in respect of research question 2, research question 3 and research question 4 are discussed in the following section.

**Research Question 2:** *How did teachers from different cultural groupings respond to the online environment?*

**Research Question 3:** *How did female and male teachers respond to the online environment?*

**Research Question 4:** *How did teachers with different stated learning preferences respond to the online environment?*

There were some gender differences. Male teachers from an Anglo culture tended to prefer visual material over written instruction and to be taught by a teacher, whereas female teachers from Anglo cultures tended to indicate they prefer written material, to learn on their own and did not express a preference to be taught by a teacher.

No other specific cultural differences were found other than male teachers from an Indian cultural background had a very strong preference to learn from a teacher.

There were differences in learning style preferences expressed, but these did not seem to be related to attitudes expressed about the online environment or related to gender or cultural background. The major preference expressed by teachers was to learn on their own using practical guided material, but with access to a teacher as needed. There was a strong sense



expressed that working in a group was also valued by this group. The high level of satisfaction expressed would tend to indicate that the flexible nature of the online environment combined with the overall quality of the education materials was sufficient to adequately meet the different learning needs of the adult learners.

There did not appear to be wide spread major differences based on these factors. The small group of male teachers from India expressed a high preference to be taught by a teacher, but in general found the online environment suited their needs, provided sufficient online teacher support was provided. This contrasted with a similarly small group of four female teachers from the USA who were strongly independent learners and did not prefer to learn from a teacher. With respect to the group of Indian teachers, this attitude may have more to do with lack of familiarity with online environments than with a specific preference to be taught by a teacher. However, the attitudes expressed are consistent with a general cultural characteristic outlined in the GLOBE study of seeing the teacher as the authority figure. The online environment did have a significant online teacher presence and hence the preference for wanting a teacher was in fact met by the way the course was structured.

Another difference that emerged was that more males preferred a visual environment as compared to female teachers who preferred written material. However, in general all the teachers expressed degree of satisfaction with the range of materials presented on the course and did not raise this issue in any of the qualitative responses.

The online environment was able to meet the needs of the different groups. However, as pointed out by Joy et al. (2009) and Zualkerman (2006) and reviewed in Chapter 2, this may not be that surprising, and is probably due to the fact that the discipline of computer science has transcended cultural and gender differences. As highly qualified teachers, characterised as independent learners, the group has self selected itself and hence possesses similar

characteristics, which are possibly somewhat independent of gender and culture. Whilst the sample seems to be representative of the teachers who have taken the courses, it is a voluntary sample. We do not know therefore if it is truly representative, and in any event it is likely that computer science teachers are not representative of the general group IB teachers in how they might respond to online PD.

In summary, there did not appear to be significant differences between the various groups in terms of gender, culture, or in terms of expressed learning style and in the way the online environment was able to meet this. The group as a whole was characterised by a high degree of learner independence who typically preferred to learn on their own but who did place value on learning with others and via a teacher. The exception was the small group of four female teachers from the USA who were strongly independent.

Adult learners are usually considered to be independent learners and this is the case with the group studied in this research. However, 55% of teachers in this highly educated and independent group indicated a preference to be taught directly by a teacher. Whilst they indicated a high degree of satisfaction with the online course, it is likely that this was directly related to the hands on approach adopted by both online teachers as much as the online environment itself.

### **5.3 Research Area 2**

**Research Question 5:** What role did the online teacher play in maintaining motivation, maintaining interest in the course and supporting the learning of the teachers?

The general finding is that for a number of teachers who experienced difficulties the role of the online teacher was very important, especially with male Indian teachers who indicated a very high preference to being taught by a teacher. The online teacher played an important

role in maintain or restoring motivation levels if the teacher experienced personal or professional difficulties that otherwise would have impacted on their capacity to keep going.

The two online teachers are expert computer science teachers with considerable IB computer science teaching experience. As such the online course mirrors a traditional expert system, in that the expertise has been assembled into the online course materials. However, access to these materials is not sufficient to guarantee successful engagement with the course.

The online teacher played an important role of guiding and tutoring many of the teachers. Providing comments and suggestions for improvement and marking and returning assignments promptly. The most common reason for decreased motivation was related to overwhelming competing demands on a teacher's time. The online teachers adopted a very flexible approach to due dates. This level of flexibility was seen as a vital component in assisting many teachers to complete the courses.

The most common way that the online teachers maintained teacher's interest was to provide timely, detailed and accurate feedback to questions and items of assessment.

In addition to maintaining interest, prompt and knowledgeable feedback was seen as being important to assist in learning. A number of teachers also commented that it was important that the online teacher actively participated and was persistent in keeping people working.

It was also seen as important that the material presented was directly relevant to the teaching of the dossier and examination. The analysis of the learning materials indicates that each is directly related to the practical classroom needs of the teachers and hence met an important characteristic of online PD for teachers.

**Research Question 6:** How important was the level of empathy shown by the online teacher?

This characteristic of the online teacher, and hence of the online environment, was seen as very important by a range of teachers. Whilst a number of teachers indicated a preference to learn on their own, most of these teachers also appreciated the way the online teachers responded in an empathetic manner. As one teacher indicated:

“I was very encouraged by the level of understanding that the facilitator provided. His approach towards correcting my errors and dwelling on the string points provided excellent encouragement” (Teacher 29, Male, Ghana)

and another said:

“What I could observe during the course was, he takes care of each participant, values their work, give suggestions as how to go about in future”. (Teacher 21, Male, India)

The online world can be impersonal and participants can feel isolated as commented by two teachers on the importance of empathy:

“Obviously very important as it is easy for one in my situation to feel very isolated and lacking support” (Teacher 41, Male, Scotland)

and

“It is very important, the instructor gives you self confidence and you feel that you are not alone” (Teacher 20, Female, Mexico)

There did not appear to be any cultural or gender effects. The above comments are intended to be representative and indicate that even for a group of highly qualified computer science teachers who were independent learners access to a teacher who was empathetic was seen as an important characteristic of the online environment.

In conclusion, the research has shown that an online PD environment can meet the needs of teachers drawn from different cultures and diverse geographic locations. In this particular situation there did not appear to be overt differences in the overall attitudes of teachers based on differences in gender, cultural background or stated learning preference. The group was characterised as highly qualified and motivated independent adult learners. However, the role of the online teacher was seen by a range of teachers as important to maintain their motivation when they experienced problems meeting deadlines or coping with external demands on their time. Being flexible with timelines for assessment was seen as an important aspect of the way the course was run. These are important features of online PD that need to be constantly considered when developing and deploying online PD.

Collaborative work, particularly in the workshops with exam and dossier marking, was seen to be very useful. The associated use of the forums was also seen as being important. The major limiting factor was seen to be time zone problems. This is likely to be associated with many teachers' desire for immediate feedback or contact. It was apparent from teachers who had attended both modes of the workshop that many teachers found the lack of immediacy a disadvantage of the online environment, whilst a number had formed the view that the online environment had the advantage of allowing time for more in-depth learning. Of course these are not opposing views, but it does indicate that a lack of immediacy, as a characteristic of the online environment, may present problems for certain teachers. This attitude did not however seem to be linked to gender, culture or learning preference.

A number of teachers, and this is also true of the online teachers, were not highly experienced in the use of online environments. One of the deficiencies detected in the analysis of the learning materials was the absence of training materials on how to interact with an online course and also a lack of collaborative activities in the two Java courses. It is highly likely that much more needs to be done in terms of education about how to use these types of

environments in order to address teacher concerns about issues like time zone differences. This would include skilling the online teachers on ways to promote effective collaboration.

#### **5.4 Assessment of online environment**

The researcher developed a list of learning and assessment criteria based on what the literature suggested represent good online pedagogical practice. These were applied to the online PD courses in Computer Science and the designs of the course were found to be consistent with good practice. However, more needs to be done to promote collaboration in the Java courses and possibly some additional capacity for teachers to be able to self direct what is covered in the courses is desirable.

The online courses seem to also be consistent with the objectives of the IB with the exception of the development of knowledge resources and fostering ongoing teacher contact.

Finally, as mentioned above, the course objectives also are consistent with what teachers indicated are desirable characteristics of an online environment. In particular, tasks should be directly relevant, practical, include reflection and encourage deep thinking and be able to share with others.

## **Chapter 6 – Key findings, recommendations and conclusions**

In this chapter a discussion of the key findings is undertaken, a list of recommendations based on the study, including recommendations for future research, is outlined and a brief conclusion to the study presented.

### **6.1 Discussion of key findings**

#### **Research Area 1**

**Findings - Research Question 1** How did teachers respond to different aspects of the online learning environment?

##### **Q1.1 Experience starting the course and using the LMS**

Teachers were experienced as classroom teachers but 15 of the 41 had no experience of LMS and 19 indicated only some experience. Generally the teachers reported no ongoing technical difficulties accessing the course.

##### **Q1.2 General issues of Motivational**

Motivational issues reported by the teachers was not related to specific aspects of the online course design, rather they related to personal or conflicting work requirements.

##### **Q1.3 Comparison of face-to-face workshops with online.**

Teachers who had experienced face-to-face workshops also found they were able to use the online environment. This was true for those that favoured the face-to-face model. The major benefit of the online environment was that it allowed time to experiment and learn over time. This contrasted with the immediate feedback available in face-to-face mode.

#### Q1.4 Usefulness of forums

Forums were seen as beneficial by 85% of the teachers, however, some reported negative feelings due to lack of response by other candidates.

#### Q1.5 Contact with other teachers

A high proportion (63%) found contact with other teachers beneficial but that this contact did not continue after the course. This is an important finding for the IB as they see the online PD as an important element of building an online learning community.

#### Q1.6 Impact on teaching

Teachers reported that the course has a positive impact on their understanding of how to teach the Dossier and prepare students to a high level of readiness for the exams. This is an important outcome for the IB as a specific aim of the online PD is build a higher level of understanding in the teaching body to improve results at the higher end.

#### Q1.7 Course format & usefulness of course materials and time undertaken

The materials were generally seen as useful but there was less support for group work. This is related to Q1.5 above. A number of teachers found that group was difficult due to time zone problems and also to unproductive group members. The week by week release was accepted by teachers, but a number indicated that would have preferred to see the entire course from the start.

#### Q1.8 Attitude to the IB's proposed changes to Assessment.

Teachers expressed diverse opinions about the need for summative assessment and the formal grading of assignments. Some favoured this, especially in relation to group work, where some



teachers were concerned about equity of the assessment of individual contributions, whilst other teachers expressed strong sentiments that such assessment was not desirable.

### **Findings - Research Question 2, 3 & 4**

The key findings related to these three research questions are addressed together.

**Research Question 2:** How did teachers from different cultural groupings respond to the online environment?

**Research Question 3:** How did female and male teachers respond to the online environment?

**Research Question 4:** How did teachers with different stated learning preferences respond to the online environment?

Given the parameters of the sample, there did not appear to be major differences in how teachers from different groups based on gender, culture, or learning styles were able to effectively use the online environment. Caution should be exercised in extrapolating this finding to more general, less specialised groups. This group of teachers were highly motivated and independent active learners, with specialised understanding of computer environments. The nature of the course presentation was able to meet the needs of the teachers by using a variety of learning materials and assessment items, which possibly minimised problems, thus catering for differences in learner characteristics.

### **Research Area 2: Role of the teacher**

**Research Question 5** What role did the online teacher play in maintaining motivation, maintaining interest in the course and supporting the learning of the teachers?

The general finding is that for a number of teachers who experienced difficulties the role of the online teacher was very important, especially with Indian teachers as mentioned above, who indicated a very high preference to being taught by a teacher. The online teacher played an important role in maintain or restoring motivation levels if the teacher experienced personal or professional difficulties that otherwise would have impacted on their capacity to keep going.

The two online teachers are expert computer science teachers with considerable IB computer science teaching experience. As such the online course mirrors a traditional expert system, in that the expertise has been assembled into the online course materials. However, access to these materials is not sufficient to guarantee successful engagement with the course.

The online teacher played an important role of guiding and tutoring many of the teachers. Providing comments and suggestions for improvement and marking and returning assignments promptly. The most common reason for decreased motivation was related to overwhelming competing demands on a teacher's time. The online teachers adopted a very flexible approach to due dates. This level of flexibility was seen as a vital component in assisting many teachers to complete the courses.

The most common way that the online teachers maintained teacher's interest was to provide timely, detailed and accurate feedback to questions and items of assessment.

In addition to maintaining interest, prompt and knowledgeable feedback was seen as being important to assist in learning. A number of teachers also commented that it was important that the online teacher actively participated and was persistent in keeping people working.

It was also seen as important that the material presented was directly relevant to the teaching of the dossier and examination. The analysis of the learning materials indicates that each is

directly related to the practical classroom needs of the teachers and hence met an important characteristic of online PD for teachers.

**Research Question 6** How important was the level of empathy shown by the online teacher?

Notwithstanding the independent nature of the group of teachers and their specialised knowledge of computer systems, approximately half the teachers experienced motivation issues, due mostly to the competing pressures of their jobs and family life. The empathetic and flexible nature of the online teachers was seen by the participants as extremely important in ensuring the management of their motivation issues and the consequent successful completion of the course. Some teachers received time release from their schools and this seemed to be an effective strategy, none of these teachers experienced the same level of problem with competing time demands.

### **Assessment of online learning environment**

The online computer science courses provided an active learning environment that suited a variety of learning styles. The materials meet the key requirement of teachers, that is: they are practical and closely related to the classroom needs of the teachers. Collaboration, facilitated by the use of forums and group assignments, has proved successful, particularly in the online workshop, but has also presented problems for teachers across different time zones. The course design also meets the majority of the criteria set by the IB online PD department, but more needs to be done to enhance post-course teacher contact with the aim of promoting an ongoing sharing of ideas.

## **6.2 Recommendations**

Three sets of recommendations are made. The first set is for developers of online PD, the second set is for the IB online PD department and the third is for future research.

### **6.2.1 Online PD developers**

The following recommendations are made to online PD developers.

**6.2.1.1** It is recommended that online developers be provided with adequate training related to the effective design and running of online courses. Active participation is not necessarily something that just occurs and needs careful and skilful handling by the online teacher to foster its growth.

**6.2.1.2** It is recommended that online developers also provide teachers with access to training on how to use online environments. It is important to also foster an appreciation of the key design elements of good online environments, such as, the need for participants to be actively involved.

**6.2.1.3** It is recommended that online developers present material in a range of ways and make suitable provision to meet the needs of visual learners, rather than provide a series of readings and questions.

## **6.2.2 IB online PD department**

The following recommendations are made to the IB and the IB online PD department in Cardiff, Wales.

**6.2.2.1** It is recommended that the IB online PD department intensify its efforts to develop suitable training for developers of online environments.

**6.2.2.2** It is recommended that the IB online PD department deploys a suitable online software tool that enables teachers to gain some information about their learning preference. This knowledge would be particularly valuable to first time teachers to assist them make appropriate use of the online environment.

**6.2.2.3** It is recommended that the IB online PD department investigate ways of effectively engaging teachers post-course to attempt to develop further the establishment of a community of IB teachers.

**6.2.2.4** It is recommended that the IB provide schools with the advice that it is considered good practice to provide some level of time release for teachers when they are completing the online PD.

**6.2.2.5** It is recommended that the IB give further consideration to the format of online PD assessment in light of the views expressed by teachers about the desirability or otherwise of formal grading and the use of summative assessment.

### **6.2.3 Future research**

The study has not revealed significant impediments to the effective participation in the online courses due to difference in gender, culture or learning styles. However, the literature tends to suggest that such difference may exist. It is also possible, for example that teachers in response to question 52: *“Comment on any cultural issue you think might be relevant to improving the learning experience for the broadest audience by the meeting the needs of the culturally diverse nature of the teachers”*, did not feel it reasonable to make critical comments – due to cultural deference. The literature reviewed in Chapter 2 tends to suggest that participation in forums, for example, maybe hindered by language barriers, on the other hand teachers reticent to participate in formal classroom settings may find the online environment more appealing. Clearly, the potential for this is possible given the diverse nature of the IB teacher base.

The following recommendation is made in respect of this issue.

**6.2.3.1** Further ongoing research is conducted to monitor the potential for cultural and/or language differences to impact on the effective participation of teachers in interactive and collaborative PD environments.

The current computer science course is deployed using the Open Source Moodle LMS. This has proved to be effective and is obviously cost effective. Limited use has been made of additional online services such as online classrooms and live video.

The following recommendation is made in respect of this issue.

**6.2.3.2** Research needs to be performed to evaluate the most suitable LMS that also includes the capacity to integrate online video and shared interactive meeting facilities, such as an online classroom.

The effectiveness of online teaching strategies is an important area. A key finding in this study was that the role of the online teacher was vitally important. This role includes that of effectively fostering teacher involvement in interactive activities. Such involvement does not simply happen.

The following recommendation is made in respect of this issue.

**6.2.3.3** Research needs to be conducted into effective online teaching strategies, materials and assessment strategies, especially as they relate to fostering active participation.

### **6.3 Conclusion**

The online courses have been successfully developed and run. The responses from teachers indicate that the course design was sufficiently varied to meet the needs of the teachers.

Gender and cultural differences did not appear to play limiting roles in the successful completion of the courses by teachers from either gender or from the many cultural groups that teachers came from. The role of the teacher however was seen by a majority of teachers as a significant factor in ensuring they completed the course. The importance of the role was also noted by a number of teachers in the way the online teachers interacted online and with the provision of timely feedback.

The stated learning preferences indicated that teachers were on the whole independent learners able to operate in isolation, but also placed value on interaction, hence were probably well suited to the online environment. The lack of immediacy of interaction was seen by teachers who have also completed equivalent face-to-face workshops as being a disadvantage

of the online version, but others saw the online mode as providing a way to work at their own pace.

This particular group is a specialised one and caution should be exercised in generalising any of the findings and applying them to less computer aware groups. The recommendations focus on providing training to both developers and teachers in how to best operate in an online course. Research is recommended to be conducted to ensure that cultural differences do not limit effective online use, the most effective LMS platforms are evaluated and, effective teacher strategies, learning material development strategies and assessment strategies that foster active participation are determined and disseminated.

The research achieved the stated purpose outlined in Chapter 1 and focused on the relationship between the characteristics of the adult learners and those of the online environment. In answering the first research question '*What relationship exists between the characteristics of the teachers and features of the online environment*' it was found that key characteristics of gender and culture did not seem to be related to how teachers responded to the online environment. The flexible nature of the online environment enabled teachers with different stated learning preferences to use it successfully. In answering the second research question '*How important are interactions with the online teacher in completing the course*' it was found that the flexible, encouraging and empathetic characteristics of the online teacher were important in ensuring that teachers felt supported and were able to balance the competing pressures of balancing work, family and completing the course.



## Appendix A1: Detailed description of the online courses

### Introduction

The purpose of this section is to outline the specific nature of the courses as they appeared to the teachers. This is done by providing an image of each screen and a brief discussion of the specific nature of each activity or assessment items shown on the screen. In Chapter 4 an analysis of the design of the courses is provided. This analysis is done by using a checklist of features one would expect to find in a well designed online PD course. The checklist is based on what the literature, reviewed in Chapter 2, indicates are essential features of a well designed online PD course.

The screen interface for each course is now outlined and the key features discussed.

### Initial Opening Screens

The following two screens are common to each course and provide the interface that teachers used to access the desired course (<http://www.ib-computing.net>).

Teachers access the courses by selecting the Login (Moodle) option.



Figure A1.1 Opening screen of online courses (source: <http://www.ib-computing.net>)

Teachers are then taken to the screen shown below and select the teacher workshop option as shown. Teachers can optionally link directly to the desired course and thus bypass these opening screens.

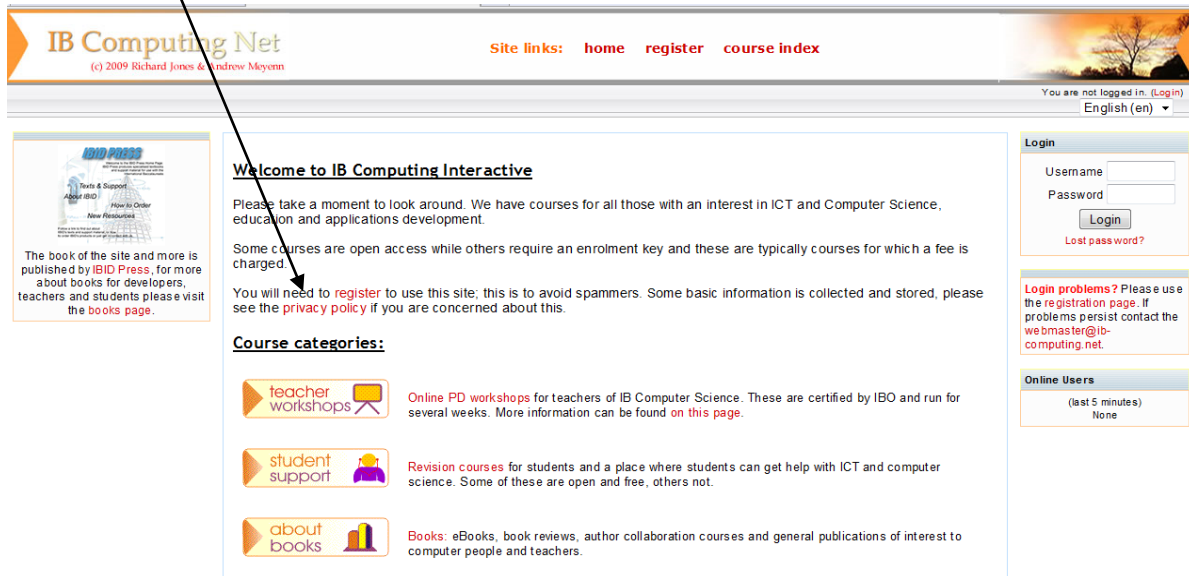


Figure A1.2: Opening screen for courses

## Online Workshop

The initial screen is set out using the standard Moodle week by week structure, with a three column format. The middle column shows the course contents and the left and right columns provide various options, e.g. calendar, list of due dates etc.

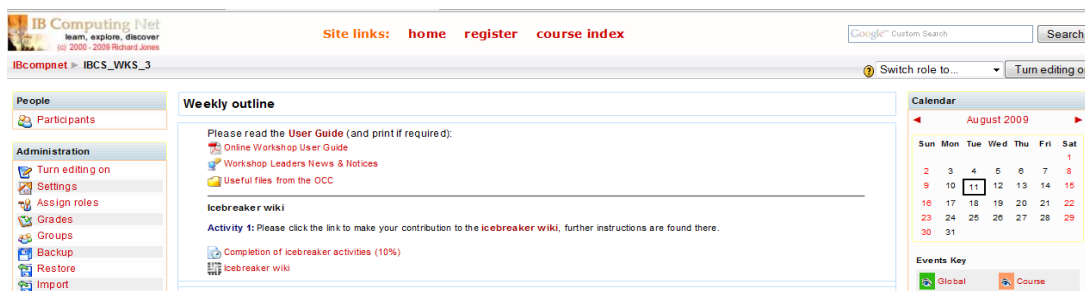


Figure A1.3 Opening screen of the workshop

Teachers are provided with a link to the Online Workshop User guide and folder that contains useful information from the IB's Online Curriculum Centre (OCC). The initial activity

requires teachers to access a Wiki and create a page where they provide some details about themselves and also ask any specific questions they would like addressed. This activity is worth 10% of the overall assessment. The aim is to encourage the teachers to be actively involve in the course and to provide some capacity for self direction.

## Week 1

The week 1 screen is shown below. This week address the use of the subject guide, examinations and exam script marking. Each week uses a forum which teachers use to ask questions and provide responses to the marking activities. The first activity asks teachers to write questions about the subject guide, these are uploaded to wiki. The first assessable activity, worth 10%, is to write three exam questions, which are uploaded to the forum for sharing and marking. The exam marking activity, worth 15%, is group based and requires teachers to work in small groups to mark sample exams. The marks are recorded on a spreadsheet and then uploaded to the forum.

Figure A1.4 Week 1 of the workshop

The online teacher then assesses the marks against the examiners and provides feedback. The feedback is provided via a forum posting. The marks are recorded using the assessment link –

see Script Marking Activity (15%). The marks allocated to each teacher are accessible throughout the course and enables teachers to track their progress. A grade of 80% is required before a certificate is awarded. Whilst there is deadline for each assessment items these dates are not enforced and teachers are able to negotiate on late submission. Grading is based on a reasonable attempt at completing of the activity not on correctness.

## Week 2

Week two focuses on the programming dossier, which is completed by students using the Java programming language. It is a substantial piece of work and contributes 35% of the overall course grade and is internally assessed but moderated worldwide based on school samples.

The aim of the assessment items is to actively involve the teacher in developing a suitable dossier problem (10%), lesson plans for introducing the dossier (10%) and to get the teachers to read and respond to the IB teacher support material (6%). These activities are not group based but teachers are encouraged to collaborate either via email or by use of the forums. A forum is again used to upload teacher responses.

28 March - 3 April

**Week 2 - Mostly about The Program Dossier**  
Estimated completion time: about 6 hours.

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Summing up Action Verb, Program and Script Marking, on to the dossier.  
[Examination tips for students](#)

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Introducing the dossier; read the overview. There is an ungraded reflection activity to be completed.  
[Dossier Forum](#)  
[Activity: Reflection on the dossier reading](#)  
[Suggested responses to the reflection activity](#)

---

**Activities 4 & 5: Managing the selection of the dossier topic.** There is an initial reading on the key points that need to be made to students. There are also further ideas and notes on dossier selection.  
[Upload a suitable dossier topic form to the Dossier Forum \(10%\)](#)  
[Upload a lesson plan to the Dossier Forum \(10%\)](#)

---

Preparation for the dossier marking exercise. Read the overview of the assessment criteria. There is an ungraded reflection activity designed to test your understanding of the dossier criteria.  
[Reflection on the dossier criteria](#)  
[Suggested responses to the reflection activity](#)

---

The teacher support material is available in pdf from [this link \(4 Mb download\)](#). Section C comprises sample material from student dossiers illustrating the assessment criteria for teachers.

**Activity 6 - read the material and post a summary of any issues needing clarification to the Dossier Forum.**  
[Activity 6 \(5%\)](#)

Figure A1.5 Week2 screen of the workshop

## Week 3

Week three concentrates on the marking of the dossier against IB provided assessment criteria. The dossier marking exercise (15%) can be completed by the individual teacher or by a group. The other activity in week 3 requires teachers to develop and share a dossier timeline for they will use for their students.

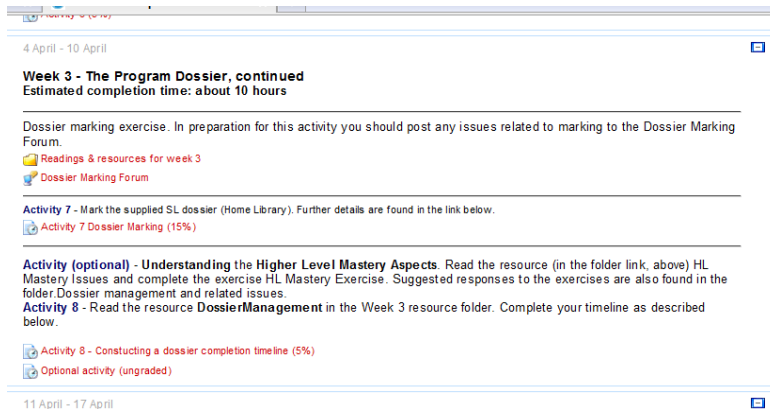


Figure A1.6 Week 3 of the workshop

## Week 4

Week 4 focuses on the extended essay and use of the case study, and contains four assessment tasks. Each IB student completes an extended essay and students can write the essay on a topic related to computer science.

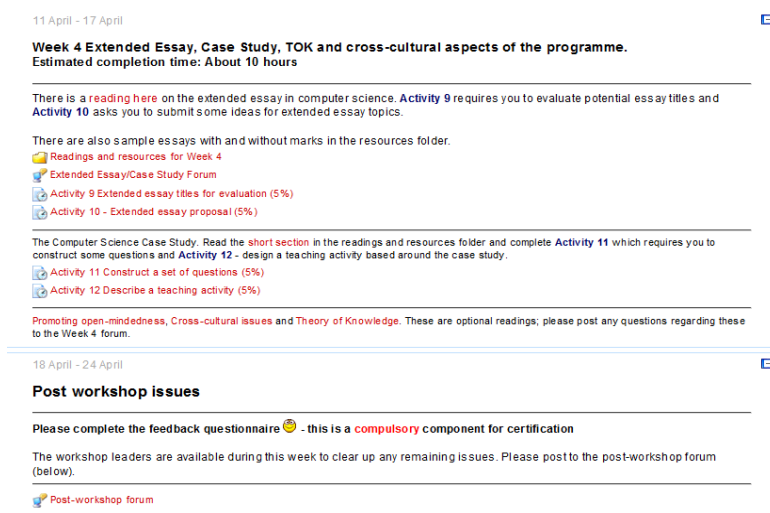


Figure A1.7 Week 4 of the workshop

The Case Study is specific to the computer science course and is intended to provide a context for the teachers to structure the teaching of the computer science theory. All students study the same case study and it is examined in the second paper of either the standard or higher level examination.

The two assessment items related to the external essay require teachers to evaluate a list of possible extended essay titles (5%) and to write a proposal for an extended essay (5%). The two assessment items related to the Case Study require teachers to construct a set of possible exam questions (5%) and describe a possible teaching activity (5%). The final activity is to complete the course evaluation.

In summary, the design of the course provides scope for active teacher involvement in practical curriculum focused exercises that are directly relevant to their teaching. The assessment items are based on group and individual work, and require reflection on what has been learnt. Forums are used to share, post questions and responses to assessment items.

### **SL Java for the Dossier**

This course is specifically designed for teachers to learn the Java and algorithm concepts required to by students to demonstrate mastery. The dossier is assessed in two ways: criteria and mastery factors. The report produced by students needs to address a set of criteria outlined by the IB. These criteria are addressed in the online Workshop described above. The mastery factors are assessed by use of a check list. The check list outlines a set of Java programming skills that the student must show mastery of. At SL the check list contains 15 skills of which the student must show mastery of at least 10. The overall mark is reduced by 10% for every mastery factor less than 10, e.g. if the student shows mastery of 7 factors their mark is reduced by 30%.

The introductory screen – see Figure A1.7 below - of the course is exactly the same as for the workshop and requires teachers to complete a self introduction by using a Wiki. Teachers are also provided with basic terminology and a set of readings covering basic Java programming concepts. The course then runs for four weeks with the option for a catch up week at the end of week 2.

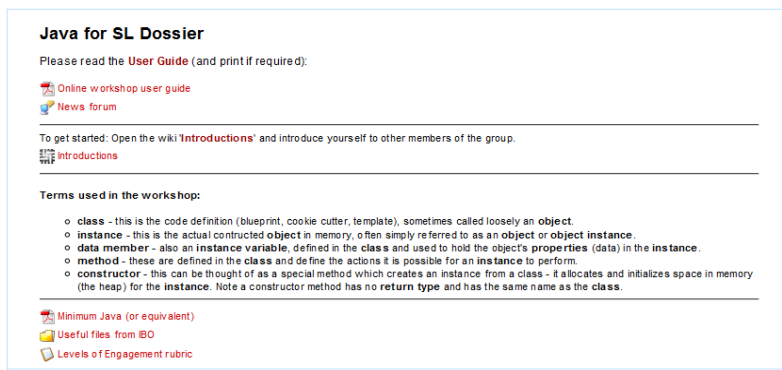


Figure A1.8 First screen of the SL Java for the Dossier

## Week 1

Week 1 focuses on basic Java Programming skills required for the SL course. The concepts covered include Object Oriented Programming Concepts. Teachers are able to work in pairs

or complete the work individually.

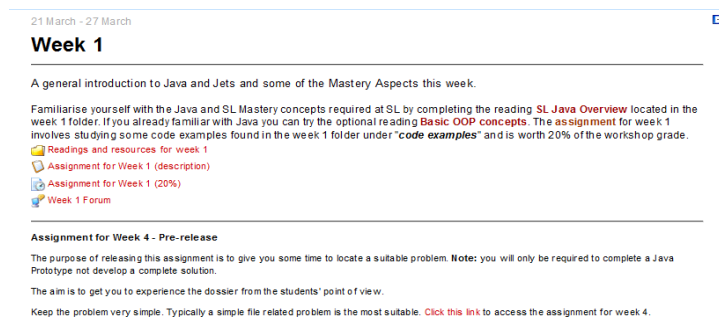


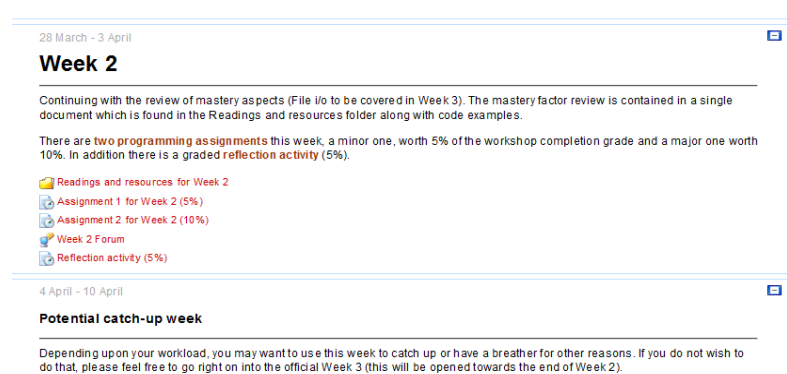
Figure A1.9 Week 1 of the SL Java for the Dossier

The assignment for week 1 is worth 20% and involves completing a set of basic computer programming exercises. Teachers upload the completed exercises to the forum and are able to

share and view other teacher's responses. The assignment for week 4 is also introduced. This is an important aspect of the course because it requires teachers to experience exactly what the students are required to go through.

## Week 2

This week focuses on specific programming concepts and requires teachers to complete two programming assignments, worth 15% in total. Teachers are provided with a considerable number of sample programs to guide them when completing the assignments. The assignments are completed individually but teachers are free to collaborate. The third assessment item is a reflective activity and requires teachers to write and share a reflection related to the concepts learnt. This is normally a difficult week in terms of time, especially if the teachers are not fully familiar with some basic algorithmic techniques. For this reason an optional catch-up week has been introduced. Teachers are free to use this or to go onto week 3 in the normal timeframe.



28 March - 3 April

### Week 2

Continuing with the review of mastery aspects (File i/o to be covered in Week 3). The mastery factor review is contained in a single document which is found in the Readings and resources folder along with code examples.

There are two programming assignments this week, a minor one, worth 5% of the workshop completion grade and a major one worth 10%. In addition there is a graded reflection activity (5%).

- Readings and resources for Week 2
- Assignment 1 for Week 2 (5%)
- Assignment 2 for Week 2 (10%)
- Week 2 Forum
- Reflection activity (5%)

4 April - 10 April

### Potential catch-up week

Depending upon your workload, you may want to use this week to catch up or have a breather for other reasons. If you do not wish to do that, please feel free to go right on into the official Week 3 (this will be opened towards the end of Week 2).

Figure A1.10 Week 2 of the SL Java for the Dossier



## Week 3

Week 3 has the same structure as week 2 and requires teachers to complete two computer programming assignments (20%) and a reflection exercise (5%). The assignments can be completed via collaboration but are typically completed individually.

4 April - 10 April

**Potential catch-up week**

Depending up on your workload, you may want to use this week to catch up or have a breather for other reasons. If you do not wish to do that, please feel free to go right on into the official Week 3 (this will be opened towards the end of Week 2).

---

11 April - 17 April

**Week 3**

Read the Exception handling reading first and try out the example code. Then complete the **first assignment**.

Next read the File handling reading and try out the associated code. There is a **second assignment** related to this.

The **third assignment** for this week is a **reflection activity** which should prove useful as you contemplate your week 4 task.

- Readings and resources for Week 3
- Assignment 1 for Week 3 (10%)
- Assignment 2 for Week 3 (10%)
- Week 3 Forum
- Reflection activity (5%)

The GUI design and prototyping reading is optional - you may choose to teach students only using console applications. This topic and/or exception handling can be used to claim use of the additional libraries mastery aspect).

Figure A1.11 Week 3 of the SL Java for the Dossier

## Week 4

Week 4 places significant demands on the teachers. There are two programming tasks (30%), the second of which is the assignment introduced in week 1 and simulates a Dossier task. The programming of a basic graphic user interface (GUI) is introduced via examples and a number of sample programs are provided for teacher reference.

18 April - 24 April

**Week 4**

There is an initial reading on using file serialization and an **assignment (10%)**. You have seen the week 4 assignment in week 1 but it is repeated here as well. This **final assignment** is worth 25% of the course grade. Please don't forget to complete the **feedback questionnaire** - this is a compulsory component for certification.

**Important!** Don't forget that the criteria change for candidates submitting dossiers from 2010. The new guide is in the link "Useful file from the OCC".

You probably should address the Week 4 assignment only using the criteria in this new guide - this should be significantly less work - if you have yet to submit candidates dossiers for 2009 it is getting a little late.

- Readings and resources for Week 4
- Assignment 1 for Week 4 (10%)
- Assignment 2 for Week 4 (final 25%)
- Week 4 Forum
- Feedback Questionnaire

Some further examples of Swing GUI objects which might be interesting.

- Java Program - demo, how to use JTextArea Class
- JSlider and JSpinner Demo
- Demo with JRadioButton
- Java Productivity Classes and Interfaces
- Text scanner (new) multiple window GUI application
- Initial design document for scanner

Figure A1.12 Week 4 of the SL Java for the Dossier

## HL Java for the Dossier

The HL course has a similar structure to the workshop and SL course. Teachers are required to complete a self introduction using a wiki, and a number of preliminary readings are provided. A forum is also provided to allow teachers to submit specific questions.


**Java for HL Dossier**

Pre-course activities: Please read the *outline* and *who the workshop is* for to re-familiarize yourself with the aims of the workshop.

**TASKS:**

1. Open the wiki 'Introductions' and introduce yourself to the other members of the group.
2. Familiarize yourself with the Java required at HL and the HL Mastery factors by reading the relevant sections of the Course Outline.
3. Reading: HL Mastery Factors Review
4. Reading: Java Basics quick review
5. Reading: Java JETS and IBIO Class

Program Listings referenced here will be found in the week 1 program folder

 [News forum \(workshop leaders\)](#)

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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.

---

 [Workshop outline \(revised\)](#)


 [Who the workshop is for](#)

 [Finding your way around the course - Moodle features](#)

 [Useful files from the OCC](#)


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Introductory wiki


 [Introductions](#)

---

Preliminary Readings

 [HL Mastery Factors Overview](#)

 [Java Basics - a quick review](#)

 [B JETS and IBIO Class for IO](#)

---

When **posting to forums** you are automatically "**subscribed**" - this means you will receive copies of posts via **email**. You will see your current subscription status near the top right of the forum. You can change this at any time in most forums. **Read tracking** (tells you which posts you've read and which not) can also be enabled or disabled.


 [Preliminary Questions \(Forum\)](#)

Figure A1.13 First screen of the HL Java for the Dossier

The HL course is difficult and covers a range of computer programming concepts that are equivalent to those taught at University. At HL a student has to show mastery of 10 programming skills from a list of 15.

The course runs for five weeks with week 3 being a catch up week.

## Week 1

Week 1 contains a range of sample programs that demonstrate how to achieve mastery of 5 of the mastery factors available at HL. Teachers complete one programming assignment (20%) to demonstrate that they have mastered the necessary skills. Typically the assignment does not involve collaboration. No reflective activity is involved and often teacher experience difficulty with the programming task.

**Week 1**  
**Contents**

1. Mastery Factors for Object Oriented features: encapsulation, inheritance and polymorphism
2. Mastery Factors for Merging and Parsing
3. Mastery Factors for Hierarchical Composite Data Structures (HCDS)
4. Weekly Assignment.

Work through the readings and complete the activities. Post to the Forum for sharing ideas, initiating discussions and asking questions.

---

[Forum for week 1 activities and questions](#)

---

Readings for week 1

---

[Mastery Factors: Inheritance, Encapsulation, Polymorphism](#)  
 [Mastery Factors: Merging and Parsing](#)  
 [Mastery Factors: Hierarchical Composite Data Structures](#)

---

Complete the assignment and post the program in a zip file and include a 200 word reflection as per the assignment.

---

[Assignment Week 1](#)

---

Scource code readings 2 & 3 and the Assignment.  
Program Animals in the ZOO, in reading 1, for you to do!

---

[Week 1 Programs](#)

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Relevant extracts from the May 2006 Subject Report

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[OOP Mastery factors](#)  
 [Parsing a text file or other stream](#)

---

**Assignment for Week 5 - Pre-release**  
The purpose of releasing this assignment is to give you some time to locate a suitable problem. **Note:** you will only be required to complete a Java Prototype not develop a complete solution.  
The aim is to get you to experience the dossier from the students' point of view.  
Keep the problem very simple. Typically a simple file related problem is the most suitable.

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[Assignment 1 \(20%\)](#)

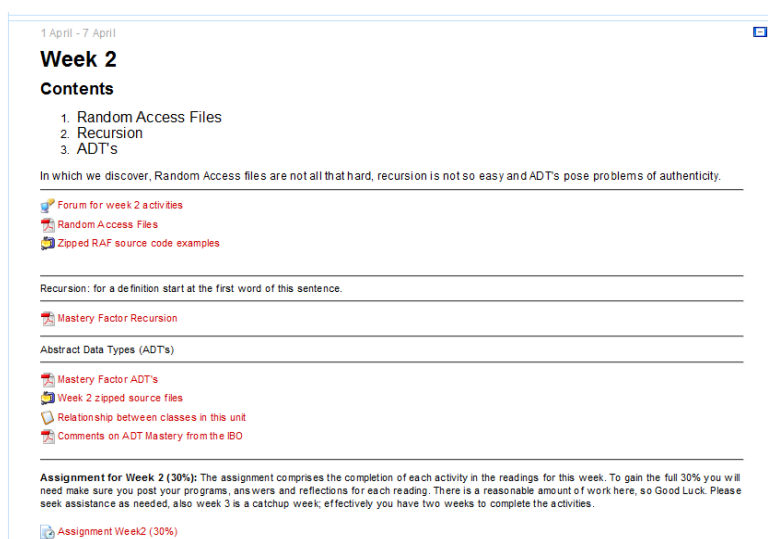
Figure A1.14 Week 1 of the HL Java for the Dossier

The experience of the researcher is that often teachers find this first week difficult and required a lot of support. The second research question looks specifically at the role of the teacher and it is major contention in this research project that this role is vital. Whilst the course is designed to be self contained and self guided it is based on the assumption that teachers possess the stated pre-requisite knowledge. Unfortunately, this has proved to not

always be the case and has necessitated considerable online teacher intervention. This has been a successful strategy which resulted in a very low drop-out rate, with most teachers completing the course.

## Week 2

Week 2 continues in the same vein as week 1 and covers 9 more mastery factors. The assignment for week 3 (30%) is comprised of a range of programming tasks. Mostly teachers are provided with code examples which they modify.



The screenshot shows a course page for Week 2, dated 1 April - 7 April. The page title is "Week 2" and the section is "Contents". The contents list includes: 1. Random Access Files, 2. Recursion, and 3. ADT's. Below the list, there is a paragraph: "In which we discover, Random Access files are not all that hard, recursion is not so easy and ADT's pose problems of authenticity." This is followed by a list of links: "Forum for week 2 activities", "Random Access Files", and "Zipped RAF source code examples". Another paragraph follows: "Recursion: for a definition start at the first word of this sentence." This is followed by a list of links: "Mastery Factor Recursion", "Abstract Data Types (ADT's)", "Mastery Factor ADT's", "Week 2 zipped source files", "Relationship between classes in this unit", and "Comments on ADT Mastery from the IBO". At the bottom, there is a paragraph: "Assignment for Week 2 (30%): The assignment comprises the completion of each activity in the readings for this week. To gain the full 30% you will need make sure you post your programs, answers and reflections for each reading. There is a reasonable amount of work here, so Good Luck. Please seek assistance as needed, also week 3 is a catchup week; effectively you have two weeks to complete the activities." This is followed by a link: "Assignment Week2 (30%)".

Figure A1.15 Week 2 of the HL Java for the Dossier

This is probably the most important section of the HL course as it addresses a range of mastery factors that student often do not program well and this often results in mark downgrades following moderation. The concepts of recursion and Abstract Data Types (ADTs) are difficult to master.

## Week 3

Week 3 has been added as a catch up week.

---

8 April - 14 April

### Week 3

---

We have inserted this week to provide time to complete the activities from Week 2 and to catch-up with anything outstanding from Week 1.

However, some readings in week 4 and 5 may still refer to week 3 and 4!!

---

Figure A1.16 Week 3 of the HL Java for the Dossier

## Week 4

Week four completes the coverage of HL mastery factors and introduces the programming of graphic user interfaces (GUI) by example. There is one programming assignment (20%). The assignment requires teachers to simulate the development of prototype use a GUI and write a reflection about what was learnt about developing a prototype. This is an important exercise as prototyping is the basis of the Dossier.

---

15 April - 21 April

### Week 4

#### Contents

1. Binary Trees - the upper limit of the programming theory in the IB CS course. Attempt the exercises in the reading and post questions and solutions to the forum as needed. Not formally assessed as part of this weeks assignment.
2. Building simple GUIs and Prototypes - how to use Swing is covered and the assignment steps you through how to build a simple prototype.

#### Binary Trees

---

- Binary Tree ADT
- DoDictionary Java source files and words.txt
- Relationship of Classes in this unit

---

#### GUIs and building simple prototypes

This section looks at how to build simple and useable GUIs without using one of those overly-complex IDE's that build them graphically. The assignment in the last week uses the ideas presented here to build a prototype.

---

- Simple Swing GUIs
- GUI source files for the reading

---

**Assignment Week 4:** Building a simple prototype. This is an important exercise as it is the lead in to the final assignment.

- Assignment Week 4
- Assignment Week 4 (20%)
- Week 4 Forum

---

#### Additional Program Examples:

Included in the zip file are some additional program examples:

Serialization: a reading and code examples.

Java Collections: sample program covering a range of Java classes, which may or may not be acceptable to support Mastery factors.

Java GUI Spinner and Radio button demos.

---

- Week 4 Additional Programs

---

Figure A1.17 Week 4 of the HL Java for the Dossier

## Week 5

The last week of the course requires teachers to create a prototype for a real-life task and to simulate the initial phases of the Dossier. The final assignment (30%) requires the program prototype to be completed but importantly places teachers themselves in the situation that the students will experience. They are required to outline how mastery can be shown but they do not have to program the functions. The final component of the assignment is a reflection that asks the teachers to comment on what they have learnt, what they experienced, what they would do differently, and how the simulation will help in teaching.

22 April - 28 April

### Week 5

Contents

This is the last week! The assignment requires you to complete a prototype for a real problem and to outline the design. Keep the problem simple, it should be similar to a student dossier problem. The aim is to actively engage you in Stages A & B of the dossier.

---

- Forum for week 5 activities
- Week 5 assignment
- Assignment 5 (30%)

---

29 April - 5 May

### Post-workshop

A week of post-course events and news. Please complete the questionnaire (compulsory component for certification).

- Post workshop forum
- HL Evaluation Questionnaire

Figure A1.18 Week 5 of the HL Java for the Dossier

## Summary

The structure of both online Java courses is similar. Teachers are provided with readings related to mastery factors and computer science theory, along with a range of sample computer programs that demonstrate key programming concepts. Forums are used for teachers to post questions and to submit assignment work. The assignment work is practically focused and the final assignment requires teachers to experience precisely what their students are required to do when completing the dossier. Importantly there is a requirement for teachers to reflect on what they have learnt and how they will approach teaching based on this learning. The workshop requires collaboration, but the SL and HL do not formally

require this, although teachers are free to do so. Assessment of completion is based on making reasonable attempts at 80% of the assessment tasks.

## Appendix A2: Survey

This a copy of the questions that comprise the online survey, a mapping notation has been included – shown in italics – to show the relationship of the questions to the research questions.

*(Q1 & Q2 used to filter in relation to research questions 2 & 3)*

Q1 Indicate Male or Female: male, female

Q2 Please enter your country of birth

*(Q3 related to research question Q1.1)*

Q3 Indicate your experience of online education prior to completing the first Computer Science course: first, some, experienced

*(Q4 – Q18 Administrative related not specifically related to the research questions)*

Q4 Indicate your qualifications: PhD, Masters of Computer Science or IT, Masters – other, Degree or Diploma – computer science or IT, Degree or Diploma - other

Q5 Enter the year you completed your most recent qualification containing some Computer Science or Information Technology

Q6 Write the name of the institution at which the degree stated in Q5 was obtained.

Q7 – 10 Indicate your teaching experience: number of years of teaching overall, Number of years teaching in an IB School, Number of years teaching IB Computer Science, Number of years teaching non-IB Computer Science or IT courses

Q11 – 13 Indicate the major reason for doing the course: required by school, quick refresher course, updated knowledge to teach computer science in the future, improve knowledge for current teaching.

Q14 If you did not complete any of the courses you enrolled in please outline the reasons.

Q15 If no formal IB certificate was awarded would you have still undertaken the courses?  
Yes, No

Q16 How did you become aware of the courses? OCC, IB – coordinator, IB advertising, other.

Q17 If you answered ‘Other’ to question 16 please specify your response here.

Q18 Who suggested you doing the course? Self, School via PD, school

*(Q19-Q22 related to research question Q1.1)*

Q19 Was the information you received prior to enrolling on the Moodle site appropriate?  
Yes, No.

Q20 If you answered no to Q19 please outline how material could be improved.

Q21 Did you find the Moodle – LMS easy to use? Yes, Mostly, No found it difficult to use.



Q22 Outline problems encountered using the LMS.

*(Q23 to Q27 related to research question 1.2 and more importantly to research question 4)*

Q23 Before describing your preferred way to learn something new in the next questions, please rank each of the following statements as you feel they describe your preferred learning style: 1 – never preferred, 2: sometimes, 3: neutral, 4: prefer, 5: strongly prefer.

- a. I prefer to learn on my own
- b. I prefer to learn with others
- c. I learn best with a detailed step by step guide
- d. I learn best from a teacher or instructor
- e. I learn best from diagrams not written material
- f. I learn best from written material
- g. I need a broad overview to see how everything fits together
- h. I prefer to learn the theory rather than do practical exercises
- i. I prefer to learn from non-guided practical experimentation
- j. I prefer to learn from guided practical exercises

Q24 Describe your preferred way to learn something new.

Q25 Outline to what extent the online course suited your preferred way to learn.

Q26 Outline to what extent the online course did NOT meet your preferred way to learn.

Q27 Outline what improvements you would recommend be added to help meet your learning preference.

*(Q28 to Q30 related to research question Q1.3)*

Q28 During any of the courses did you experience times when your motivation or desire to continue declined? Yes, No

Q29 If you answered Yes to Q28, please outline the reasons and describe how you were able to restore your motivation levels.

Q30 If you answered No to Q28, please outline the reasons your motivation levels remained positive.

*(Q31 related to research question Q1.4)*

Q31 If you have participated in a normal face-to-face IB Computer Science workshop could you briefly compare your face-to-face experience with the online experience.

*(Q32 related to research question Q1.5)*

Q32 The course made extensive use of forums as a way to submit questions and assignments. Please briefly comment on how helpful the forums were to you learning.

*(Q33 & Q34 related to research question Q 1.6)*

Q33 Outline briefly how the contact with fellow participants, especially during group work, was beneficial or otherwise to your learning during the course.

Q34 Outline briefly if you have maintained connections with fellow participant teachers you meet during the course.

*(Q35 related to research question Q1.7)*

Q35 Describe briefly how the online courses have impacted on your teaching.

*(Q36 to Q39 related to research question Q1.8)*

Q36 The courses are presented in a controlled week by week manner. Please outline if this structure meet your needs or why you would prefer an alternative.

Q37 The Online Workshop course provided a range of learning materials and activities. To what extent did you find these useful or not useful to your learning?

1: not very useful, 2: occasionally useful, 3: neither, 4: mostly useful, 5: very useful

Readings

Script marking

Dossier marking

Group work

Q38 The Online Java courses provided a range of learning materials and activities. To what extent did you find these useful or not useful to your learning?

1: not very useful, 2: occasionally useful, 3: neither, 4: mostly useful, 5: very useful

Readings

Reflective exercises

Practical programming tasks and assignments

Dossier simulation project

Group work

Q39 – 44 Indicate the percentage of time when you undertook the course(s):

39: At home before school on a week day

40: During school time on a week day

41: After school before returning home on a week day

42: Home during the evenings of a week day

43: During the daytime of a weekend

44: During the evenings of a weekend

Q45 Could you please indicate how important each of the following aspects was in relation to your interaction with the course facilitator.

1: of no importance, 2: little importance, 3: neither, 4: important, 5: very important.

Frequency of casual contact e.g. via email updates or reminders

Frequency of response to your specific requests

Length of responses as compared to speed of response

Timely feedback on assessment items

Effectiveness of responses to problems found.

Q46 Outline the importance of the level of empathy shown by the facilitator.

Q47 Outline the most effective ways that the facilitator assisted in maintaining your interest in the course.

Q48 Outline the best practices followed by the facilitator and comment on how these assisted your learning.

Q49 If you fell behind at any stage, comment on your feelings at these times and outline how you were able to catch up and meet assessment requirements.

Q50 Indicate which of the following features are seen by you as important for online professional development courses.

1: of no importance, 2: little importance, 3: neither, 4: important, 5: very important

Tasks presented in a controlled and sequential manner

Some tasks enabling me to explore and experience uncertainty

Tasks directly relevant to my teaching

Tasks that include reflection that allow me to think deeply how I would approach my teaching

Tasks that enabled me to share my understanding with others.

Q51 Comment on any cultural issues you think might be relevant to improving the learning experience for the broadest audience by meeting the needs to the culturally diverse nature of teachers.

*(Q52 is related to research question Q1.9)*

Q52 Outline your reactions to the following points related to assessment and the awarding of certificates:

There should be summative assessment task

All assessment items should be graded rather than just noted as done or not done.

An acceptable level of participation is necessary in group work or discussion

Participants need to show a good level of reflection and critical thinking

Q53 Please use this last section to provide a summary comment about whether the courses have met your requirements and also, provide any additional information or feedback that you think maybe relevant.

## Bibliography

- Achtemeier, SD, Morris, LV & Finnegan, C.L 2003, 'Considerations for developing evaluations of online courses', *Journal of Asynchronous Learning Networks*, vol. 7, no.1, from [http://www.aln.org/publications/jaln/v7n1/pdf/v7n1\\_achtemeier.pdf](http://www.aln.org/publications/jaln/v7n1/pdf/v7n1_achtemeier.pdf)
- Allert, J 2004, 'Learning Style and factors contributing to success in an introductory computer science course', in Proceedings 4<sup>th</sup> IEEE International Conference Advanced Learning Technologies (ICALT), Joensuu, Finland, August 2004, pp. 385-389
- Alonso, R, Lopez, G, Manrique, D & Vines, JM 2005, 'An instructional model for web-based e-learning education with a blended learning process approach', *British Journal of Educational Technology*, vol. 36, no. 2, pp. 217-235.
- Aragon, SR, Johnson, SD & Shaik, N 2000, The influence of Learning Style Preference on Student Success in Online vs. Face-to-Face Environments, Proceedings of the WebNet 2000 Conference, San Antonio Texas 2000, pp 17 – 22.
- Bauer, C, Chin, KL & Chang, V 2000, 'Web-Based Learning: Aspects of Cultural Differences', ECIS Conference Proceedings, accessed 5 April 2009, from <http://is2.lse.ac.uk/asp/aspecis/20000068.pdf>
- Birman, BF, Desimone, L, Porter, AC & Garet, MS 2000, 'Designing Professional Development that works', *Educational Leadership*, 57(8), pp 28-33.
- Brittan-Powell, C, Legum, H & Talyor, E 2008, 'The relationship between Student Learning Style, Selection of Course Delivery Format and Academic Performance', *International Journal of Instructional Technology and Distance Learning*, vol. 5, no. 5, accessed 4 April 2009, from [http://www.itdl.org/Journal/May\\_08/index.htm](http://www.itdl.org/Journal/May_08/index.htm).
- Bryman, A, & Bell, E 2003, *Business Research Methods* (1<sup>st</sup> ed.), New York, Oxford University Press Inc.
- Cercone, K 2008, 'Characteristics of adult learners with implications for online learning design', *AACE Journal*, vol. 16, no. 2, pp137-159.
- Coffield, F, Mosely, D, Hall, E, & Ecclestone, K 2004, *Learning Styles and Pedagogy in Post-16 Learning: A Systematic and Critical Review*, accessed 30 March 2009, from <http://www.lsrc.ac.uk/publications/index.asp>
- Cox, S 2008, 'Learning Styles in Online Environments', Tomei, LA (ed). *Encyclopedia of the Information Technology Curriculum Integration*, Information Science Reference, USA, vol. 2, pp. 525-532.

- Cresswell, J 2003, *Research Design Qualitative, Quantitative and Mixed Methods Approaches* (2<sup>nd</sup> Ed.) Thousand Oaks, California, Sage Publications.
- Cuthrell, K & Lyon, A 2007, 'Instructional Strategies: what do online students prefer?', *Journal of Online Learning and Teaching*, vol. 3, no. 4.
- Dabaj, F & Basak, H 2008, 'The role of gender and age on students' perceptions towards online education case study: Sakarya University, Vocational High School', *Proceedings of world academy of science, engineering and technology*, vol. 29.
- Dennen, V 2008, 'Pedagogical Lurking: student engagement in non-posting discussion behaviour', *Computers in Human Behaviour*, vol. 24, no.4.
- Devlin, SL 2006, 'Investigating the Effect of Language and Culture on Student Interaction with and in WebCt', *Proceedings of the 7<sup>th</sup> Annual Conference of the Higher Education Subject Centre for Information and Computer Science*, accessed 5 April 2009, from [http://www.ics.heacademy.ac.uk/italics/vol6iss2/siobhan\\_devlin.pdf](http://www.ics.heacademy.ac.uk/italics/vol6iss2/siobhan_devlin.pdf)
- Diaz, DP & Cartnal, RB 1999, 'Students learning styles in two classes: online distance learning and equivalent on-campus', *College Teaching*, Vol. 47, No. 4, pp 130-135.
- Ellis, T, & Cohen, M 2005, 'Building the better asynchronous computer mediated communication system for use in distributed education', *Proceedings of the 35<sup>th</sup> Frontier in Education Conference* (pp T3E15-T3E20). Piscataway, NJ: IEEE.
- Fang, L 2007, 'Perceiving the useful, enjoyable and effective: a case study of the e-learning experience of tertiary students in Singapore', *Educational Media International*, Vol. 44. No.3.
- Ford, N, 2004, 'Towards a model of learning for educational informatics', *Journal of Documentation*, vol. 60, no. 2.
- Glass, J & Sue, V 2008, 'Student preferences, satisfaction, and perceived learning in an online mathematics class', *Journal of Online Learning and Teaching*, vol. 4, no. 3.
- Goold, A, Craig, A & Coldwell, J 2007, 'Accommodating culture and cultural diversity in online teaching', *Australasian Journal of Educational Technology*, Vo. 23, No. 4, accessed 3 March 2009, from <http://www.asclite.org.au/ajet/ajet23/goold.html>
- Grant, MR & Thornton, HR 2007, 'Best practices in Undergraduate Adult-Centered Online Learning: Mechanisms for Course Design and Delivery, *MERLOT Journal of Online Learning and Teaching*, Vol. 3, No. 4, December 2007.
- Grasha, A & Riechmann, S 1995, *Grasha-Riechmann Learning Styles*, accessed 4 April 2009, from <http://www.personality-project.org/perproj/others/heineman/grslss.htm>

- Gunawardena, C & Karunanayake, S 2008, Women's Participation in Online Learning: A study of OUSL Educational Technology Course, accessed 10 April 2009, from [http://www.nodes.lk/Women%20-%20CENWOR%20-%20Paper\(Final\).doc](http://www.nodes.lk/Women%20-%20CENWOR%20-%20Paper(Final).doc)
- Gupta, V, Hanges, PL & Dorfman, R 2002, 'Cultural clusters: methodology and findings', *Journal of World Business*, vol 35, pp 11-15.
- Hannon, J & D'Netto, B 2007, 'Cultural diversity online: student engagement with learning technologies', *International Journal of Educational Management*, vol. 21, no. 5, accessed 5 April 2009, from <http://www.emeraldinsight.com/0951-354X.htm>
- Hasson, J. 2005, E-learning: A progress report, accessed 24 September 2005, from <http://www.fcw.com/print.asp>
- Herrington, J, Oliver, R & Reeves, TC 2002, 'Patterns of engagement in authentic online learning environments', *ASCILITE 2002 Conference Proceedings*, accessed 12 September 2005, from <http://www.ascilite.org.au/conferences.html>
- Hofstede, G 1997, *Cultures and organizations : software of the mind*, McGraw-Hill, New York.
- House, RJ, Hanges, PJ, Javidan, M, Dorfman, PW, & Gupta, V 2004, *Culture, Leadership and Organisations: The GLOBE Study of 62 Societies*, Sage Publications.
- IB Online PD Policy 2007, IB Policy Document made available by the IB.
- Jamieson, S 2004, 'Likert scales: how to (ab)use them', *Medical Education*, vol 38, pp1212-1218.
- Joy, S & Kolb, DA 2007, 'Are there Cultural Differences in Learning Style', *Journal of Intercultural Relations*, vol. 33, No. 1, p69-85, accessed 6<sup>th</sup> April, 2009, from [http://www.sciencedirect.com.ezp.lib.unimelb.edu.au/science?\\_ob=PublicationURL&\\_ctockey=%23toc%235849%232009%23999669998%23961082%23FLA%23&\\_cdi=5849&\\_pubType=J&\\_acct=C000028178&\\_version=1&\\_urlVersion=0&\\_userid=559483&md5=2ae792e8442457a34f0d27f9f0015eee&jchunk=xxx](http://www.sciencedirect.com.ezp.lib.unimelb.edu.au/science?_ob=PublicationURL&_ctockey=%23toc%235849%232009%23999669998%23961082%23FLA%23&_cdi=5849&_pubType=J&_acct=C000028178&_version=1&_urlVersion=0&_userid=559483&md5=2ae792e8442457a34f0d27f9f0015eee&jchunk=xxx)
- Kao, CP & Tsai, CC 2009, 'Teachers' attitudes toward web-based professional development, with relation to Internet self-efficacy and beliefs about web-based learning', *Computers & Education*, accessed 4 March 2009, from <http://www.elsevier.com/locate/compedu>
- Kiel, R & Pegrum, M 2007, Re-Skilling Librarians: An e-learning professional development course at the University of Western Australia, accessed 4 April 2009, from [http://www.information-online.com.au/sb\\_clients/iog/bin/iog\\_programme\\_A8.cfm?vm\\_key=7E8BE521-1422-72D3-A05F8F2ABFAF7091](http://www.information-online.com.au/sb_clients/iog/bin/iog_programme_A8.cfm?vm_key=7E8BE521-1422-72D3-A05F8F2ABFAF7091)

- Kolb, D 1984, *Experimental Learning: Experience as a Source of Learning and Development*, Prentice-Hall.
- Kolb, D 2005, *The Kolb learning style inventory – version 3.1: self scoring and interpretation booklet*, Boston MA, Hay Resources Direct.
- Knowles, MS 1990, *The adult learner: A neglected species* (4<sup>th</sup> ed.), Houston, Gulf Publishing.
- Li, Q 2005, 'Gender and CMC: A review on conflict and harassment', *Australasian Journal of Educational Technology*, vol. 21, no. 3, pp. 382-406.
- Lim, DH 2004, 'Cross Cultural Differences in Online Learning Motivation', *Educational Media International*, vol.41, No. 2, p163-175, accessed 3 March, 2009, from <http://www.informaworld.com.ezp.lib.unimelb.edu.au/10.1080/09523980410001685784>
- Lu, J, Yu, CS & Liu, C 2003, 'Learning style, learning patterns and learning performance in a WebCT-based MIS course', *Information & Management*, vol. 40, pp 497-507.
- Maor, D 2004, 'Pushing beyond the comfort zone: Bridging the gap between technology and pedagogy'. *Proceedings ASCILITE conference*, accessed 27 September 2005, from <http://www.ascilite.org.au/conferences/perth04/procs/maor.html>
- Mason, R 2006, 'Learning Technologies or adult continuing education', *Studies in Continuing Education*, vol. 28, no. 2, July 2006, pp. 121-133.
- Meiselwitz, G & Sadera, WA 2008, 'Investigating the connection between usability and learning outcomes in online learning environments', *Journal of Online Learning and Teaching*, vol. 4, no. 2.
- Meyer, KA 2003, 'The web's impact on student learning', *T.H.E. Journal Online*, viewed 19 September 2005, from <http://www.thejournal.com/magazine/vault/articleprintversion.cfm?aid=4401>
- Meyers, W, Bennet, S & Lysaght, P 2004, Asynchronous communication: strategies for equitable e-learning, In *beyond the comfort zone: proceedings ASCILITE 2004*, accessed 5 April 2009, from <http://www.ascilite.org.au/conferences/perth04/procs/meyers.html>.
- Negroponete, N 1995, *Being digital*, Hodder & Stoughton, Sydney
- Neuhauser, C 2002, 'Learning Style and Effectiveness of Online and Face-to-Face Instruction', *The American Journal of Distance Education*, vol. 16, no. 2, pp 99-113.
- Oliver, R 2001, 'Seeking best practice in online learning: Flexible Learning Toolboxes in the Australian VET sector'. *Australian Journal of Educational Technology*, vol. 17, no. 2, pp. 204-222, from <http://www.ascilite.org.au/ajet/ajet17/oliver.html>
- O'Neil, K, Singh, G & O'Donoghue, J 2004, 'Implementing eLearning Programmes for Higher Education: A review of the Literature', *Journal of Information Technology Education*, Vol. 3, pp 313-323. accessed 1 September 2005, from <http://jite.org/>

Palloff, RM & Pratt, K 2003, *The virtual student: A profile and guide for working with online learners*, San Francisco, Josse-Bass.

Panda, S 2004, Framework of online professional development, *Learning & Teaching in Action*, vol. 3, no. 1, accessed 14 March 2009, from <http://www.celt.mmu.ac.uk/Itia/issue7/panda.shtml>

Patton, M 2002, *Qualitative Research Methods & Evaluation Methods*, Thousand Oakes, Sage Publications.

Phelps, R, Graham, A & Kerr, B 2004, 'Teachers and ICT: Exploring a metacognitive approach to professional development', *Australian Journal of Educational Technology*, vol. 20, no. 1, pp49-68.

Prensky, M 2001, 'Digital Natives, Digital Immigrants', accessed 5 April 2009, from <http://www.marcprensky.com/writing/>

Prince, M 2004, 'Does active learning work? A review of the research', *Journal of Engineering Education*, vol. 93, no. 3.

Quitadamo, IJ 2001, 'Effective teaching styles and instructional design for online learning environments', paper at National Education Computer Conference: "Building on the Future", Chicago, USA.

Rivera, B & Rowland, G 2008, 'Powerful E-learning: a Preliminary Study of Learner Experience', *Journal of Online Learning and Teaching*, vol. 4, no. 1.

Sahin, I 2007, Predicting student satisfaction in distance education and learning environments, ERIC.

Santovec, ML 2004, 'Virtual learning communities lead to 80 percent retention at WGA', *Distance Education Report*, vol. 8, no. 8.

Savery, JR 2005, 'Be VOCAL: characteristics of successful online instructors', *Journal of Interactive Online Learning*, vol. 4, no. 2.

Schrum, L & Hong, S 2002, 'Dimensions and strategies for online success: voices from experienced educators', *Journal of Asynchronous Learning Networks*, vol 6, No. 1, accessed 5 April 2009, from [http://www.sloan-c.org/publications/jaln/v6n1/v6n1\\_schrum.asp](http://www.sloan-c.org/publications/jaln/v6n1/v6n1_schrum.asp)

Shanahan, MW 2008, 'Cultural Differences in Learning and Implications for Distance Delivery of Educational Programmes to Developing Nations: A case study of Fiji', *Journal of College Teaching & Learning*, Vol. 5, No. 2, accessed 12 January 2009, from <http://www.cluteinstitute.com/JCTLMain.htm>

Sheard, J & Lynch, J 2003, 'Accommodating Learner Diversity in Web-based Learning Environments: Imperatives for Future Developments', *International Journal of Computer Processing of Oriental Languages*, vol. 16, no. 4, pp 243-260.



Signer, B 2008, 'Online professional development: combining best practices from teacher, technology and distance education', *Journal of In-service Education*, vol. 34, No 2, pp. 205-218.

Sims, R, Dobbs, G & Hand, T 2001, Proactive evaluation: new perspectives for ensuring quality on online learning applications, In (Kennedy, G, Keppell, M, McNaught, C & Petrovic, T (Eds.) *Meeting at the crossroads: Proceedings of ASCILITE 2001*, (pp 263-270). Melbourne: The University of Melbourne.

Solomon, BA & Felder, RM 2009, Learning Styles and Strategies, accessed 5 April 2009, from <http://www4.ncsu.edu/unity/lockers/users/f/felder/public/ILSdir/styles.htm>

Standford-Bowers, DE 2008, 'Persistence in Online Classes: A Study of Perceptions among Community College Stakeholders', *Journal of Online Learning and Teaching*, vol. 4, no. 1.

Stodel, EL 2006, 'Learners' Perspectives on what is Missing from Online Learning: Interpretations through the Community of Inquiry Framework', *The International Review of Research in Open and Distance Learning*, vol. 7. No. 3, accessed 5 April 2009, from <http://www.irrodl.org/index.php/irrodl/search/authors/view?firstName=Emma&middleName=J.&lastName=Stodel&affiliation=University%20of%20Ottawa>

Sun, PC, Tsai, RJ, Finger, G, Chen, YY & Yeh, D 2008, 'What drives a successful e-Learning?', An empirical investigation of the critical factors influencing learner satisfaction', *Computers & Education*, vol 50.

Tallent-Runnels, MK, Thomas, JA, Lan, WY, Cooper, S, Adhern, TC, Shaw, SM & Liu, X 2006, Teaching courses online: a review of the research, *Review of Educational Research*, vol. 76, no.1.

Thompson, LF, Meriac, JP & Cope, JG 2002, 'Motivating online performance: the influences of goal setting and Internet self-efficacy', *Social Science Computer Review*, vol. 20, no. 2.

Ticehurst, G. W & Veal, A.J. 2000, *Business Research Methods*, Frenchs Forest, Longman.

Toland, J, Frank, J & Schenk, KD 2005 'Culture, Interaction, and Online Learning' in C Howard (ed). *Encyclopaedia of Distance Learning*, Idea Group Inc, London, vol. 3, pp. 485 – 491.

Tylee, J 2001, 'Cultural Issues and the online environment', Australia, Charles Stuart University, accessed 5 April 2009, from [http://www.csu.edu.au/division/landt/resources/documents/cultural\\_issues.pdf](http://www.csu.edu.au/division/landt/resources/documents/cultural_issues.pdf)

Vrasidas, C & Zembylas, M 2004, 'Online professional development: lessons from the field', *Education & Training*, vol. 46, no. 67, pp. 326 – 334, Emerald Publishing Group.

Wang, AY & Newlin, MH 2002, 'Predictors of web-student performance: the role of self-efficacy and reasons for taking an on-line class', *Computers in Human Behavior*, Vol. 18, pp. 151-163.

Wang, YS 2003, 'Assessment of learner satisfaction with asynchronous electronic learning systems', *Information Management*, vol. 41.

Weaver, D, Spratt, C & Nair, CS 2008, 'Academic and student use of a learning management system: Implications for quality', *Australian Journal of Educational Technology*, vol. 24, no. 1, pp 30-41.

Wenger, E 1998, *Communities of Practice: learning, meaning and identity*, Cambridge, UK, Cambridge University Press.

Willems, J. & Reed, L 2007, *Beyond Delivery: A Case Study in e-Learning for Podiatry Students*. In G. Richards (Ed.), *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2007* (pp. 6664-6671). Chesapeake, VA: AACE, accessed 4 March 2009, from <http://www.editlib.org>

Yang, JF 2008, 'Learning Styles and Perceived Educational Quality in e-learning', *Asian Journal of Distance Education*, vol. 6, no. 1, pp 63-75.

Zhu, C, Valcke, M & Schellens, T 2009, 'Cultural differences in the perception of social-constructivist e-learning environment', *British Journal of Educational Technology*, vol. 40, No. 1.

Zualkerman, IA, Allert, J & Qadah, GZ 2006, 'Learning Styles of Computer Programming Students: A Middle Eastern and American Comparison', *IEEE transactions on Education*, vol. 49, no. 4, November, 2006.



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