An Interdisciplinary Approach to Climate Change in the Middle Years: Summative Evaluation of the IMYM *Climate Change* Pilot Study

Contact Information:

Cheryl Prokopanko
Manitoba Education, Citizenship and Youth
Distance Learning and Information Technologies Unit (DLITU)
E-220 1970 Ness Avenue
Winnipeg, Manitoba R3J 0Y9
Telephone: (204) 945-6435
Email: cheryl.prokopanko@gov.mb.ca

Executive Summary

The IMYM (Interdisciplinary Middle Years Multimedia) interdisciplinary units derive their theoretical framework from the IMYM model. The IMYM model is an instructional model that blends an interdisciplinary constructivist approach with the integration of Information and Communication Technology (ICT) in order to achieve curricular outcomes. The IMYM model was designed to support teachers integrating ICT with their classroom practice. When using the IMYM model, the role of the teacher is less a disseminator of information and more a facilitator of active learning, as teachers gradually release responsibility to collaborative groups of students.

Manitoba Education, Citizenship and Youth selected fifteen teachers for the IMYM *Climate Change* pilot study over the 2003-2004 school year. Supports included student learning resources, the *Climate Change* interdisciplinary instructional unit, the online IMYM Professional Learning Community and two face-to-face professional learning sessions in August 2003 and February 2004 for the pilot teachers. Results were derived from the qualitative studies of the IMYM pilot teacher's online reflection journals, threaded discussions and feedback. Some of the key findings follow.

- There was modification in the teaching styles of some pilot teachers.
- There was change in some of the pilot teachers' perceptions regarding their role as a teacher.
- There was an increase in the job satisfaction of some pilot teachers.
- Some pilot teachers acquired new teaching skills.
- There was an increase in the technical knowledge and skills of some pilot teachers.
- There was an increase in the pilot teachers' and students' knowledge about climate change.
- There was an increase in the classroom management skills of some pilot teachers.

All key findings, as well as an overview of the entire IMYM *Climate Change* pilot study will be detailed within this report. In general terms, the IMYM *Climate Change* pilot study was deemed

a success by the IMYM pilot teachers, the IMYM development team, Manitoba Education, Citizenship and Youth and most importantly, the students.

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1.0 Introduction

In 1996, the first of five IMYM (Interdisciplinary Middle Years Multimedia) interdisciplinary units was piloted under the sponsorship of Manitoba Education, Citizenship and Youth. All IMYM interdisciplinary units derive their theoretical framework from the IMYM model. The IMYM model contains four broad beliefs about teaching and learning (IMYM, "Research Results")

- interdisciplinary constructivist approach to instruction (integration of curriculum)
- multiple disciplines are blended around a common conceptual theme to achieve deep understanding
- active student learning takes place in a real world context using Information and Communication Technology (ICT) as a learning tool
- the role of the teacher changes from a disseminator of information to a facilitator of active learning with a gradual release of responsibility to students

The IMYM model was "initiated in response to the identification of Technology as a Foundation Skill [TFS] area to be integrated throughout all Kindergarten to Senior 4 curricula. The purpose of [the IMYM model] is to develop an effective instructional model that supports integration of Information and Communication Technology [ICT] with curriculum through an interdisciplinary approach to instruction at each grade level of the Middle Years" (IMYM, "Pilot Overview"). There are currently over one hundred schools employing the IMYM model throughout the province of Manitoba.

There have been five IMYM interdisciplinary units piloted to date. Each unit is built around a different conceptual theme that integrates ICT with core curriculum. Prior themes were

- *Prairie Tour (Grade 5)*

- *Inventions, Innovations and Discoveries (Grade 6)*
- *Balance and Harmony (Grade 7)*
- *Systems and Interactions (Grade 8)*

The *Climate Change* interdisciplinary unit is the fifth conceptual theme and the theme for this pilot study.

The history of the IMYM model, the various particulars of the *Climate Change* pilot study, and the qualitative and quantitative results will all be detailed within this report. The results of this pilot study demonstrate that the pilot study was largely effective in integrating ICT into middle years curricula within the participating pilot teacher's classrooms. Furthermore, most of the pilot teachers reacted favourably to the pilot study and listed many positive impacts on student learning, their own teaching styles and their perceptions on their role as a teacher. There was also indication from the data that many of the pilot teachers experienced increased job satisfaction as well as appreciation for the opportunity to acquire new technical, instructional, and classroom management skills.

2.0 IMYM Model

2.1 Summary

The IMYM (Interdisciplinary Middle Years Multimedia) model is a curriculum-based model designed to support teachers who are integrating ICT with their classroom practice by providing a framework to achieve core curricular outcomes in an interdisciplinary context. The IMYM model is promoted by Manitoba Education, Citizenship and Youth through

- face-to-face professional learning
- online professional learning
- professional learning centres on CD-ROM
- professional learning on video

The IMYM model balances the integration of ICT with constructivist student learning, assessment strategies, and interdisciplinary curriculum (see Figure 1). The IMYM model draws upon content from core curriculum relating to a specified, pre-determined concept (e.g. climate change), the creation and maintenance of a constructivist learning environment in the classroom, and the use of authentic assessment, meaning that it assesses both the *process* as well as the *product* of engaged learning (Telus Learning Connection, 2002).

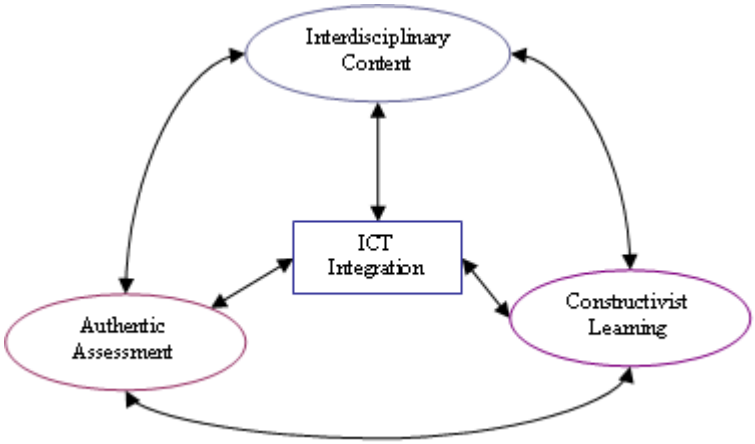

Figure 1: Representation of the IMYM Model

Teachers utilize the IMYM model for several reasons (IMYM, "FAQ"). One, the IMYM model can assist teachers in modifying their teaching style in order to better accommodate various student learning styles and multiple intelligences present within contemporary classrooms.

> *I continue to learn more about Grade 5 content and the IMYM model everyday. I am learning to step outside the box and experiment with new ideas and strategies. I try not to be intimidated by technology but to use it as a tool to help me and my students. My role as a teacher is changing in that I have had to give up some "control" and let students do some of the leading (IMYM Pilot Teacher, personal communication, February 23, 2004).*

The role of the IMYM teacher evolves from disseminator of information to facilitator of active learning. The teachers, "gradually assume the roles of co-learners and co-investigators with their

students, of facilitators, and of coaches who are there at just the right time to ask the thought-provoking question that moves student thinking and learning to a higher level" (IMYM, "FAQ").

> *My role as a teacher in the IMYM model has changed from being the giver of information to the facilitator in the students learning process. I have become in some aspects the monitor of the students learning and observer (personal communication, IMYM Pilot Teacher, February 23, 2004).*

Two, in order to optimize the effective use of ICT as a learning tool, the IMYM model requires physical rearrangement of materials (e.g., desks, computers, etc.) within the IMYM classroom. In the rearrangement process, classroom materials are purposefully arranged so that ICT may be more effectively integrated. The result of this rearrangement process is often an increase in the authentic student use of ICT. For example, computers within IMYM classrooms are often arranged in an effort to accommodate collaborative student learning.

> *My classroom is shaping up nicely. I've gotten the new computers. I now have 5 in all. They are spaced evenly around the room. With only 16 students we have a lot of space…On Thursday, I should have all the programs I need installed on the classroom computers and connected to the main server. The students are sitting in groups of 4 and are adjusting to working together (personal communication, IMYM Pilot Teacher, September 16, 2003)*

Another IMYM pilot teacher reflected

> *At present we have our computers on one side of the room, (classes are fairly small), our class pet, Gizmo the Guinea Pig, along the same wall, and a class library at the back of the room. The front has a long blackboard and the other wall is a series of cupboards for students to hang up their jackets and belongings…The student's desks are arranged in a U and there is a circle table in the middle. There is also room for 4 students to sit at the table Gizmo is on and then another large rectangular table near the cupboards, where up to 6 students can sit…Once I get a better feel for the kids I will move them into groups of 3 or 4 to do more group work (personal communication, IMYM Pilot Teacher, September 12, 2003).*

Finally, the IMYM model can assist IMYM teachers in designing a learning environment that responds to their classroom and their students' needs. The IMYM learning environment can increase the opportunity of students to better construct knowledge by using ICT and real world

connections to achieve core curricular outcomes. The current resources of any classroom can be easily incorporated into an IMYM classroom. There is purposefully no definite manner or method in which to set up an IMYM classroom because every IMYM classroom is as unique as the IMYM teacher, school and the community in which they reside. The following message was posted by a remote IMYM pilot teacher

> *At our school, students do not bring their own supplies. For some reason our supplies (pencils, paper, notebooks, etc.) did not arrive on the barge until this past Friday. We have had two days without water, a day without hydro and we are also short two classrooms. They are currently building two new classrooms for our Grade fours. This year I have 22 Grade five students. Our classroom now has four computers and one on the way. They are almost ready for our use! (Personal communication, IMYM Pilot Teacher, September 13, 2003)*

The IMYM website contains principles, guidelines and other resources (e.g., photographs) to help teachers design their own IMYM classroom. By referring to resources such as these, interested teachers get inspired with and adapt new ideas for setting up their classroom.

There are also reasons why students would want to learn within the IMYM model. Students have the opportunity to increase their ICT skills and to acquire deeper lasting understandings of real world concepts. IMYM teachers have witnessed positive changes in their students' attitudes when the IMYM model is employed. An IMYM pilot teacher for the *Climate Change* study wrote

> *I had a discussion with a parent today which I found really interesting. They said that their child was having their best year in school ever. I see the IMYM model really playing a role in providing a positive learning experience for this student...a way for her to stretch her talents, and show off her learning. I have overheard her telling other students "Just wait until you are in this class next year! It's so much fun!"…a definite feather in the IMYM hat I'd say (private communication, IMYM Pilot Teacher, December 01, 2003).*

The IMYM model was developed to provide both middle years students and teachers with the opportunity to integrate ICT into curricula and learning. However, successful ICT integration cannot be the sole responsibility of the classroom teacher. It is essential for IMYM

teachers to develop a network of support within their school and within their community. In fact, Manitoba Education, Citizenship and Youth encourages IMYM teachers to do so. Their network of support might include the principal(s), school division's ICT coordinator, technical trainer, technician, superintendent and other teachers within the school or division. "The collaboration of a team approach can result in a commitment to school growth and systemic change beyond the scope of the IMYM classroom" (IMYM, "FAQ").

The IMYM model draws its theoretical foundations from

- the community of learners theory (Brown & Campione, 1994; Scardamalia & Bereiter, 1994),
- constructivism (e.g., Jonassen, 1996, 2000),
- the integration of Information and Communication Technology (ICT) with classroom practice and curricula (e.g., Bitner & Bitner, 2002; Roberts & Porter, 1999),
- the value of interdisciplinary teaching in middle years schools (e.g., Martinello & Cook, 2000).

2.2 Establishing the IMYM Learning Community

In their community of learners theory, Brown and Campione (1994) found that respectful, contextualized discourse can be encouraged through a process of reciprocal teaching and guided discovery. In their view of a classroom community of learners, the teacher acts as a facilitator to the learning process. Brown and Campione believe that this type of facilitation can lead to distributed expertise among the community of learners whereby the distributed expertise of one learner benefits the other learners within the community via a process of knowledge-sharing and peer collaboration. Also important to note in their theory, is that the training of participants and the provision of guidance are both necessary components in developing an effective learning community.

The IMYM model provides guidance in the form of concept-based interdisciplinary units of instruction. The IMYM model promotes teachers as facilitators of learning and provides training and guidance in the pedagogy of gradual release of responsibility while encouraging synchronous and asynchronous peer discourse (e.g., face-to-face and online professional learning opportunities).

Scardamalia and Bereiter's (1994) 'knowledge-based communities' can be created by building knowledge among peers who reside within a wider sense of community. A knowledge-based community differs from a community of learners in that

> It suggests continuity with the other knowledge-building communities that exist beyond the schools, and the term *building* implies that the classroom community works to produce knowledge—a collective product and not merely a summary report of what is in individual minds or a collection of outputs from group work (p.270).

The IMYM learning community includes IMYM teachers, Manitoba Education, Citizenship and Youth, Manitoba's school divisions' superintendents, technology coordinators and technicians, school administrators, teams of teachers and their students (IMYM, "FAQ"). When developing the IMYM model and the IMYM Learning Community, development leaders drew from both the community of learners and the knowledge-building community theories.

2.3 Collaboration

Collaborative learning is a fundamental characteristic of the IMYM model. This is because learning through collaboration, is a necessary component for the construction of knowledge (Jonassen, 1996). Collaboration between teachers, administrators, school divisions etc., within the IMYM Learning Community is imperative for strong peer relations, positive learning experiences and successful professional learning initiatives (e.g., Stallings, L. &

Koellner-Clark, K., 2003). Collaboration among students and between teacher and students is also strong in IMYM classrooms.

According to Pantiz (1996, ¶3), the difference between collaborative learning and cooperative learning is straightforward. "The underlying premise of collaborative learning is based upon consensus-building through cooperation by group members…whereas cooperative learning is defined by a set of processes which help people interact together in order to accomplish a specific goal or develop an end product" which is usually content-specific. Cooperative learning is a collaborative system of classroom management that is closely controlled by the teacher (¶4). Numerous collaborative and cooperative learning strategies were used in the IMYM *Climate Change* pilot study both in IMYM classrooms and at the face-to-face teacher professional learning sessions.

Collaboration can develop through cooperation. Jonassen (1996) identifies four elements of cooperation

- positive interdependence
- individual accountability
- face-to-face interaction
- interpersonal skills

The IMYM model sets up conditions that allow collaboration to develop within IMYM classrooms. In turn, the IMYM *Climate Change* pilot study set up the IMYM Online Learning Community to facilitate collaboration and cooperation among pilot teachers. The IMYM Online Learning Community, was developed using WebCT, is an online venue for pilot teachers and members of the IMYM learning community to collaborate synchronously or asynchronously (e.g., email, real-time chatting, threaded discussions). The design of the IMYM Online Learning Community also incorporates Jonassen's four elements of cooperation.

To encourage positive interdependence, the IMYM Online Learning Community provides a *Communication Centre*. Within the *Communication Centre*, pilot teachers can

- email
- asynchronously post messages on a thematic and threaded discussion board
- synchronously "chat"
- review and post to a calendar of events
- share files and online resources with other pilot teachers

Within a discussion thread, the IMYM project leader can initiate discourse:

> *You can use this discussion thread to share what you are doing in your IMYM classroom this week. This is where you will be able to give and get ideas from each other about organizing the Climate Change pilot in your classroom. Let's create a true 'learning community' where everyone shares their ideas and where everyone's ideas are valued! (personal communication, September 08, 2003)*

For the *Climate Change* pilot study, each pilot teacher was required to reflect upon their professional learning experiences in a journal. This process addresses Jonassen's (1996) element of individual accountability. The degree to which each pilot teacher made personal entries into his/her journal varied from pilot teacher to pilot teacher. The lowest number of entries made into a reflection journal was five, while the highest number of entries was eighty-two. The pilot teachers began entering into their respective journals in September 2003 and finished writing in their journals by the end of the follow-up professional learning session (February 2004). Individual entries into the reflection journals are detailed later in this report (see Section 4.3).

Face-to-face interaction and interpersonal skills were cultivated during the professional learning sessions held in August 2003 and February 2004. Numerous strategies were used to encourage positive peer relations and collaboration during the pilot study. The majority of the pilot teachers had little previous experience with the IMYM model, so cooperation, and thus collaboration, was viewed as an essential support mechanism for them to succeed as IMYM teachers.

A study carried out by Yamagata-Lynch (2003) centred on a one-year curriculum-technology integration program for teachers (i.e. the Teacher Institute for Curriculum Knowledge about Integration of Technology [TICKIT]). Professional learning was delivered via peer collaboration. TICKIT teachers were encouraged to collaborate with other TICKIT teachers as well as administrators, non-TICKIT participants and university staff in an environment of pressure, set boundaries and multiple obligations. The end result of this study follows.

> Experience of completing a successful curriculum technology integration project played a role in confidence building of individual teachers, groups of teachers working together, and school district administrators. This confidence gave further energy to teachers and school districts to continue to pursue district-wide technology curriculum integration. Additionally, when teachers faced a challenge they felt that they had connections with other teachers, both within and outside their school district (p. 604).

Collaboration in the IMYM *Climate Change* pilot was extended with as many creative outlets as possible to enhance the support network for teachers integrating ICT as well as to provide a means of information sharing of promising classroom practices. The value of such collaboration is also acknowledged within the theory of community of learners.

2.4 Constructivism

The definition of constructivism has evolved over the years. Today, there are upwards of six different *forms* of constructivism. These include personal, radical, social constructivism, social constructionism, critical, and contextual (Geelan, 1997). For the purposes of this report, constructivism will be understood as follows.

> …knowledge is constructed out of personal sets of meanings or conceptual frameworks based on experiences encountered in relevant environments. People interact with their environment and as a result develop conceptual frameworks to explain these interactions and assist in negotiating future interactions (Newhouse, 2002, p.8).

Constructivism can be applied to both teaching styles and to teacher professional learning. Howard, McGee, Schwartz, and Purcell (2000) found that teachers learned most effectively about constructivism by *doing* constructivism. They suggest providing high levels of discussion, peer-to-peer tutoring, and learning by doing (p.461). Howard et al. approached teachers by "*content* with learning *context*" to help promote change of teaching practice towards constructivism.

Constructivism assumes that the individual learner is responsible for his or her own construction of knowledge. Even if the IMYM professional learning experiences are effectively conceptualized and presented to teachers, the teacher is ultimately responsible for his/her own learning. Likewise, even if the teacher scaffolds learning experiences for IMYM students, the student is ultimately responsible for his/her own learning. IMYM professional learning always models IMYM instructional strategies, so that the professional learning strategies are relevant and motivational to the teacher. Peterman (1993) argued that, "constructivist staff development projects [should] address the teacher as a learner and [should also] involve the teacher in *praxis*—doing, reflecting, learning, changing" (p.241).

Constructivism is an integral component of the IMYM model and the five IMYM interdisciplinary units. The IMYM model encourages learner (i.e. student and teacher) interdependence through constructivist strategies within interdisciplinary units and associated student learning centres. The IMYM model also encourages the pilot teachers to "do", "reflect", "learn" and "change" as Peterman (1993) suggests.

2.5 Integration of Information and Communication Technology (ICT)

When Information and Communication Technology (ICT) is effectively integrated into classrooms or curriculum, positive impacts on learning often results. Results include

- increased student motivation
- increased cooperation and collaboration among students
- deeper and more probing conversations between students and teachers
- encouragement of teacher-as-facilitator. (McGrath, April 1998)

The United Kingdom's (UK) government announced a major initiative to fund ICT integration initiatives into schools in 1997. The Office for Standards in Education (OFSTED) then conducted an extensive analysis on the impact of the UK government's initiatives to integrate ICT into their schools (2004). The OFSTED report provided an in-depth analysis into ICT integration initiatives and the impact they have had. The main and relevant findings are as follows

- increased staff competence with ICT
- increased ICT skills in students
- pervasive impact on teaching styles and student learning
- successful teacher training
- readily available technical support in schools directly improves the reliability of ICT resources
- positive impact of ICT in schools is rising and government initiatives to integrate ICT in schools are becoming noticeable

Manitoba Education, Citizenship and Youth sought similar results by implementing the IMYM model.

Most teachers can not easily or effectively integrate ICT into curriculum or classroom practice without professional learning and support. Moreover, if ICT is ineffectively integrated, it can play a neutral or even a negative role. Teachers need to develop a professional understanding of when and how to integrate ICT (Ping & Yong, 2003). Newhouse (2002) wrote an extensive literature review detailing the impact of ICT on teaching and learning and found that if ICT is effectively integrated, it can be a positive *impact on* (rather than *reason for*) learning and curriculum. The Committee of Development in the Science of Learning (2000 as

cited in Newhouse, 2002) suggests five strategies to use ICT to establish and sustain effective learning environments using ICT

- real world problems
- scaffolding
- feedback, reflection and guidance
- local and global communities
- extending teacher learning

Manitoba Education, Citizenship and Youth incorporates all five of these strategies in the IMYM model. The IMYM model creates effective learning environments for IMYM students and pilot teachers by addressing real world problems in interdisciplinary contexts (e.g., climate change). Manitoba Education, Citizenship and Youth defines scaffolding as "a strategy that provides adjustable and temporary assistance or support to the student in his or her achievement of the learning task" (IMYM, "Glossary"). IMYM teachers use ICT to scaffold students in the gradual release of responsibility for their own learning throughout the *Climate Change* pilot study.

Feedback, reflection and guidance were integrated into all IMYM professional learning experiences. Connecting and interacting with local and global communities was encouraged through the culminating Climate Change Awareness event of the *Climate Change* interdisciplinary unit. The entire process of being a pilot teacher extended professional learning not only of technical and pedagogical skills, but of real world issues in climate change.

2.6 The IMYM Teacher

Manitoba teachers, both male and female and of every age, came from rural, urban, inner-city and remote schools to participate in piloting prior IMYM interdisciplinary units. Neither gender, age, nor school location are variables of a successful IMYM teacher. "IMYM teachers experience most success if they are interested in learning to use teaching strategies that are

constructivist and that employ collaborative learning" (IMYM, "FAQ"). Manitoba Education, Citizenship and Youth recommends that any teacher interested in the IMYM model has

- experience with interdisciplinary instruction
- experience with collaborative learning strategies
- experience with differentiating instruction
- interest in using information and communication technology in the classroom
- interest in implementing constructivist and active learning strategies
- willingness to implement a middle years approach at Grades 5-8
- willingness to share new learning with colleagues through mentoring and collaboration (IMYM, "FAQ").

Teachers interested in the IMYM model are also made aware that there are various stages they may pass through and that the process of becoming a successful IMYM teacher does not occur instantly. Based on prior IMYM pilots and observation, Manitoba Education, Citizenship and Youth outlines the following major stages a new IMYM teacher may go through.

- **Entry stage** – may experience frustration and anxiety; may tend to replicate traditional instructional and learning activities using ICT
- **Adoption stage** – tends to use ICT to support an established teacher-directed instructional format
- **Adaptation stage** - increases student involvement, responsibility, and knowledge creation; tends to develop new teaching style
- **Appropriation stage** - develops new instructional patterns built on a collaborative interdisciplinary concept-based approach to learning
- **Invention stage**- creates an entirely new learning environment in the classroom (IMYM, "FAQ")

A potential IMYM teacher need not be overwhelmed by these stages but rather reassured, as support and expertise are provided through face-to-face professional learning experiences, the IMYM Online Learning Community, and through peer mentoring. Ultimately, if students are using ICT to learn in meaningful ways, then the IMYM teacher has succeeded.

2.7 IMYM Professional Learning Centres

Manitoba Education, Citizenship and Youth has created five IMYM Professional Learning Centres to provide IMYM teachers with opportunity for self-directed professional

learning. These five learning centres include information and resources supporting five key IMYM strategies: *Collaboration*, *Independent Learning*, *Authentic Assessment*, *Interdisciplinary Approach*, and methodology for *Setting up the IMYM Classroom*. Each Professional Learning Centre provides

- links to online research to activate prior knowledge
- a video segment featuring practicing IMYM teachers
- suggestions for applying the strategy in the classroom

The purpose of the *Collaboration* Learning Centre is to explore ways in which teachers and students can collaborate within and between IMYM classrooms. In the *Independent Learning* Centre, the purpose is to learn strategies for using student learning centres within IMYM classrooms to promote student responsiblity. The *Authentic Assessment* Learning Centre encourages teachers to explore methods of authentic assessment of interdisciplinary and collaborative learning in their IMYM classroom while the *Interdisciplinary* Learning Centre encourages teachers to explore ways to use an interdisciplinary approach to teaching within their IMYM classroom. Using an interdisciplinary approach is fundamental to achieving the desired results of this pilot study. In the *Setting up an IMYM Classroom* Learning Centre, teachers explore ways to set up their IMYM classroom in order to make the best use of time and resources that are available to them and their students.

The Learning Centres are available within the IMYM Online Learning Community, on the IMYM website, and on a CD-ROM that has been distributed across Manitoba to assist potential IMYM teachers. The purpose of the IMYM Professional Learning Centres is to familiarize the teachers with the characteristics of the IMYM model. For the *Climate Change* pilot study, the teachers were given the opportunity to experience each of the Learning Centres during the August 2003 face-to-face professional learning session.

The Learning Centres have a consistent design. There is a short overview, followed by a list of learning outcomes, resources (e.g., articles, video segments, etc.), and a six step strategy. The six step strategy helps the IMYM teacher activate prior knowledge, acquire new knowledge through self-directed study of learning resources, apply new knowledge through classroom practice, and then share new knowledge with others by

- previewing online resources
- watching a short video segment featuring practicing IMYM teachers
- making their own notes on a BLM (Black Line Master)
- determining where to use the strategy in the IMYM interdisciplinary unit at their grade level(s)
- experimenting in their classroom with the strategy
- sharing classroom experiences and strategies with the online IMYM Learning Community

3.0 Overview of the IMYM Climate Change Pilot Study

The IMYM *Climate Change* pilot study was undertaken in response to the need for the integration of Technology as a Foundation Skill (TFS) throughout revised Grade 5 curricula in Manitoba. The purpose of the *Climate Change* pilot study was to develop an effective interdisciplinary unit to replace the exiting Grade 5 IMYM unit, *A Prairie Tour ©1998*. Replacement of *A Prairie Tour ©1998* was necessary due to changes in Grade 5 curricular outcomes.

3.1 The Climate Change Interdisciplinary Unit

Cheryl Prokopanko (IMYM Project Leader), Janet Dent (Consultant), Aileen Najduch (Consultant), Michelle Larose-Kuzenko (Conseillère Pédagogique), Dawn Sutherland (Science Education Professor, University of Manitoba) and Dana Corr (Teacher/Writer, Park West School Division) comprise the IMYM *Climate Change* development team. The development team kept

the needs of Grade 5 students at the forefront of the decision-making process in creating the interdisciplinary unit on climate change.

The rationale for choosing the climate change conceptual theme was three-fold. Firstly, the diversity of topics and issues within climate change provided the opportunity to blend content from multiple disciplines; interdisciplinary content being a main component of the IMYM model. The climate change conceptual theme integrates learning outcomes from English language arts, science, mathematics, and social studies. For example, within Module 1 of the *Climate Change* interdisciplinary unit, students are required to

- collect, display and analyze weather and climate related data (i.e. mathematics)
- research water cycles (i.e. science)
- create comic strips on climate change to share with other students (i.e. English language arts)
- identify the importance of citizenship and the roles and responsibilities they have as global citizens (i.e. Social Studies) (IMYM, "About the *Climate Change* Pilot").

Secondly, topics within climate change (e.g., weather, geography) directly correlate with Specific Learning Outcomes (SLOs) within Manitoba's Grade 5 curricula (Manitoba Education, Citizenship and Youth, "Curriculum"). For example, within Grade 5 Science, students learn about weather. The topic of weather alone contains eighteen SLOs (i.e., 5-4-01 to 5-4-18). SLO 5-4-02 indicates that a student will, "describe how weather conditions may affect the activities of humans and other animals" while Module 2 of the *Climate Change* interdisciplinary unit states that students will "research consequences of climate change in the regions across Canada, and identify the social, economic, and environmental impacts" (IMYM, "*Climate Change* Concept Maps"). IMYM interdisciplinary units incorporate learning outcomes already identified and followed by teachers throughout the province.

Finally, the climate change theme is a serious issue affecting Canada. The Government of Canada states, “Climate change is more than a warming trend. Increasing temperatures will lead to changes in many aspects of weather, such as wind patterns, the amount and type of precipitation, and the types and frequency of severe weather events that may be expected to occur in an area” (Government of Canada, 2004). With climate change being such a timely issue, it is advisable for Canadian students to learn

- What is climate change?
- What are the consequences of climate change?
- What actions can individuals take to reduce climate change?

The *Climate Change* interdisciplinary unit consists of different types of learning experiences (LEs) including Ongoing Learning Experiences (OLEs), Information and Communication Technology (ICTs) Learning Experiences, and Module Learning Experiences. Each OLE provides ways for students to use ICT to complete daily, weekly, or monthly tasks throughout the school year. For example, OLE.3, *Daily Math and Problem Solving*, enables students to solve a weekly math problem and practice estimation, mental math and problem solving daily. Teachers choose from among the ICT learning experiences in order to introduce a particular ICT application to their students in the curricular context of their choice. ICT learning experiences are not repeated, nor is it necessary to do each one. For instance, ICT.4 *Looks Like This!* enables students to learn to use paint and draw software to create title pages.

There are four modules each of which has numerous LEs, all with different strategies for students to build and deepen their understanding of climate change

- Module 1 has eight learning experiences to investigate climate change
- Module 2 has seven learning experiences about the consequences of climate change
- Module 3 has six learning experiences about what can be done about climate change

- Module 4 has two learning experiences related to creating a climate change awareness event

Each LE provides a guide as well as necessary resources (e.g., BLMs) to help pilot teachers successfully complete the learning experience.

3.2 IMYM Online Learning Community

The IMYM Online Learning Community was created using WebCT™, an integrated e-learning software system. A particular strength of WebCT™ is that it provides licensed end users with the ability to customize the interface according to specific needs and style. All content within the IMYM Online Learning Community was designed for users with low bandwidth. In doing so, documents and resources can be easily obtained and shared by the pilot teachers no matter what type of Internet connectivity they have. WebCT™ provides a web-based learning environment in which online collaboration, mentoring and discourse between peers can occur. WebCT™ also offered the IMYM Project Leader a new way to conduct a pilot study by providing a forum for individual mentoring of pilot teachers.

Manitoba Education, Citizenship and Youth currently uses WebCT™ for various IMYM professional learning initiatives, such as the *Climate Change* pilot study. To participate in the IMYM Online Learning Community, pilot teachers need regular access to a computer with Internet connectivity. A user name and password is then provided to each pilot teacher to ensure security within the IMYM Online Learning Community.

3.2.1 Interface

The IMYM Online Learning Community uses a customized interface for each professional learning initiative. For the *Climate Change* pilot study, the five basic principles of web design are employed (Grantastic Designs, 2004).

- easy to read
- easy to navigate
- easy to locate
- consistent, and
- quick to download

The navigation system of the IMYM Online Learning Community is designed to be easy to use, with intuitive and consistent graphics. A link to the login screen for the IMYM Online Learning Community is situated on the left navigation bar of Manitoba Education, Citizenship and Youth's IMYM website (http://www.edu.gov.mb.ca/ks4/tech/imym/index.html). Pilot teachers participated in practice sessions of the IMYM Online Learning Community at the August 2003 face-to-face professional learning session and continued to participate throughout the Climate Change pilot.

The hyperlinks (see Figure 2) situated on the side menu bar of the IMYM Online Learning Community include

- *Homepage*
- *What's New?*
- *Professional Learning (PL) Experiences*
- *Discussions*
- *Communication Centre*
- *IMYM Learning Centres*
- *Sharing Centre*
- *Techie Toolkit*
- *Downloads*
- *Compile Notes*
- *Calendar*
- *Glossary*
- *Mail*

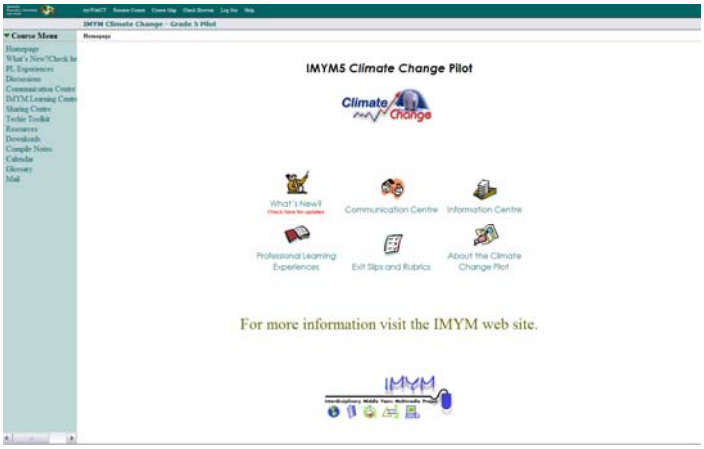

Figure 2: Screen Capture of IMYM Online Learning Community for Climate Change Pilot

Most of these hyperlinks are self-explanatory. The *Sharing Centre* is where the pilot teachers upload digital photographs of their IMYM classroom, display students' work, or share templates and files they have created. The *Techie Toolkit* provides technical documents and tutorials on how to resize digital photos, how to upload files to the IMYM Online Learning Community, and how to use the various software programs (e.g., *Inspiration*). *Compile Notes* makes all the notes associated with the *Climate Change* pilot study easily accessible and printable.

3.3 Selecting Pilot Teachers

Pilot teachers were selected based upon various criteria that included regional representation. The most important aspect of the selection process was assessing each teacher's level of expertise and interest in interdisciplinary instruction and instructional innovation. This criteria did not necessarily require a high level of ICT literacy because Manitoba Education, Citizenship and Youth believes that participating in the IMYM model is one way in which teachers can increase their ICT literacy. The process of selecting teachers for the IMYM *Climate*

Change pilot study was initiated by sending out information and an application package via the IMYM list serve and the Computer Education Coordinators of Manitoba (CECM) list serve.

The IMYM project leader outlined criteria these potential pilot teachers would need to meet in order to qualify for the IMYM *Climate Change* pilot study. These included

- teaching a grade 5 or grade 5 multilevel class during the 2003-2004 year
- teaching at least two core subjects to the same group of grade 5 students
- access to three computers situated within the classroom
- a letter of administrative support from the school of employment in the form of an email to the IMYM project leader.

The teachers were also required to write a personal narrative about their current understanding of the IMYM model and about what they were already doing in their classroom to integrate ICT with curricula. The reasoning behind this requirement was to ensure that the teacher was fully aware of the commitment and responsibilities expected and to see evidence of their dedication to improving the learning process and the integration of ICT with curriculum. Finally, potential candidates completed two self-assessment rubrics on ICT literacy and pedagogical skills in integrating ICT with curriculum and classroom practice. IMYM project leader Cheryl Prokopanko stated, "We need to know the level of ICT literacy and ICT integration of each teacher, but we did not eliminate anyone due to modest self-assessments on either of these rubrics. The self-assessment rubrics are primarily used to plan the professional learning experiences" (personal communication, April 04, 2004). The pilot teachers were informed at the start that their role would be to

- **Contribute** - to the IMYM learning community
- **Experiment** - with the IMYM model and the *Climate Change* learning experiences
- **Discuss** – their experiences with other pilot teachers
- **Share** - student samples and digital photos of their classroom
- **Reflect** - on their own learning, professional relationships, and classroom changes
- **Provide Feedback** – by completing online Exit Slips at the end of each *Climate Change* learning experience

Once selected, the pilot teachers received three days of face-to-face professional learning in August 2003, one day of follow-up in February 2004, and payment of all related expenses, including a substitute teacher.

3.3.1 Hardware, Software and Resources

The pilot study outlines hardware and software requirements for each pilot classroom (IMYM, "Hardware Model" & "Software Model"). The IMYM *Climate Change* pilot classrooms received the following resources

- a binder of *Climate Change* interdisciplinary learning experiences with an accompanying CD-ROM
- seven *Climate Change* posters
- two *Weather Trivia* calendars (2003 and 2004)
- a digital camera
- five copies of *Inspiration* concept mapping software
- *Calendar Club* CD-ROMs.

Each school provided the teacher with at least three classroom-based computers, access to the Internet, and office productivity software for their IMYM pilot classroom.

In addition, the pilot school provided access to the following hardware and software

- presentation device (such as a large screen TV, data projector, or electronic whiteboard)
- printer
- VCR
- an email client (e.g., Microsoft Outlook)
- multimedia authoring software
- photo editing software (e.g., Microsoft Office Picture Manager)
- website authoring software (e.g., Microsoft Front Page)

3.4 IMYM Professional Learning Experiences

There are many ways to define professional development, or as Manitoba Education, Citizenship and Youth prefers, professional *learning* (PL). Schlager and Fusco (2003) define professional learning for in-service teachers as

> …a career-long, context specific, continuous endeavor that is guided by standards, grounded in the teacher's own work, focused on student learning, and tailored to the teacher's stage of career development. Its objective is to develop, implement, and share practices, knowledge, and values that address the needs of all students. It is a collaborative effort, in which teachers receive support from peer networks, local administration, teacher educators, and outside experts (p.205).

Many of the components of Schlager and Fusco's definition, such as context-specific, continuous, collaborative, grounded in the teacher's work, and focused on student learning, are incorporated within the professional learning experiences of the IMYM *Climate Change* pilot study.

Craft (2000) suggests that PL initiatives should aim to improve teachers' pedagogical skills, provide an enhanced learning experience, and assist in developing deeper professional knowledge and understanding. PL about the IMYM model is intended to

- develop professional judgement as to when and how to use ICT to teach and learn
- increase job satisfaction
- develop a more constructivist view of the teacher's role
- enable teachers to anticipate and prepare for change
- aid in clarifying Manitoba Education, Citizenship and Youth's position on infusing ICT

However, IMYM professional learning on ICT integration is more than effective collaboration between teachers. It takes into account the professional growth plans of individual teachers and helps them develop professional judgement on the value of using educational technologies within a collaborative learning environment for a particular student audience and learning purpose.

Teachers bring their own technical experience, opinions and expertise to the PL equation and should be active participants who are free to choose strategies that match their own teaching and learning style (Garet, Porter, Desimone, Birman & Yoon, 2001). IMYM professional learning models the teaching strategies that are being proposed, builds on participant expertise, and scaffolds teacher learning. "In order for teachers to feel comfortable using technology,

professional development must take place in such a way that teachers feel confident in their abilities" (Bliss & Bliss, 2003, p.95).

Other considerations in defining and understanding the parameters of PL concerning ICT integration are teacher personality and needs and teacher responsibilities and workload (Yamagata-Lynch, 2003). A PL provider should consider the teachers' learning styles, personal levels of confidence and perceived control both within the PL group and within their school and classroom (Nisan-Nelson, 2001). IMYM professional learning keeps in mind that teachers are adult learners, every teacher learns differently, and some teachers may be afraid to introduce new technologies into their classroom.

PL providers should be aware of any issues that may be occurring within the school or within the PL group, as well as of the level of support of the school and its administration for the new initiative. Negative situations occurring within the school will greatly detract from the teacher's ability to effectively learn and teach. Therefore, it is the priority of IMYM professional learning to understand the specific context, needs and situation of the teachers and their school before planning the PL sessions. In this way, context and teacher-specific PL can be delivered in a more effective manner.

Applying the theory of teacher change (e.g., Clark & Hollingsworth, 2002) also plays an important part in ensuring the effectiveness of PL. IMYM teachers need to modify their teaching styles in order for ICT integration to be sustained in the classroom. Clark & Hollingsworth identify six perspectives on how teacher change occur

- change as training
- change as adaptation
- change as personal development
- change as local reform, change as systematic restructuring
- change as growth or learning (p.948).

The focus of PL should not just centre on any of these perspectives, but it should focus on the teacher as active learner through reflective and collaborative participation in all of these perspectives within the PL setting (p.948). This can include collaborating with peers, experts, parents, outside community members, school administrators, and so forth. Collaboration such as this assists in creating a forum of discussion as well as a support network for teachers. This type of forum, if continually utilized by the teachers, could assist their teaching skills and knowledge (Burbank & Kauchak, 2003). The IMYM Online Learning Community and face-to-face professional learning sessions provide this forum for *Climate Change* pilot teachers.

Professional learning was originally defined as continuous career-long, context and teacher-specific endeavours based on pedagogical standards in order to train and assist teachers to meaningfully learn, understand and use ICT within a collaborative learning environment. After further review of literature, this definition can be expanded to include a cautionary warning to PL providers to be aware of their own biases about PL and to acquire more specific information about the participating teachers. Furthermore, professional growth plans ought to consider the participating teachers' specific needs, personal and professional issues that may be occurring, their areas of specialty, personalities, workloads, learning and teaching styles. This must all be carried out while understanding the theory of change in relation to teachers and technology.

Every task within the IMYM face-to-face professional learning in August 2003 correlated directly with the *Climate Change* interdisciplinary unit. With this strong correlation, the teachers were directly and indirectly learning about the IMYM model, *Climate Change* and the various ICT integration strategies they would have to employ with their own students. The face-to-face professional learning assisted in the

development of an IMYM community of learners to encourage increased collaboration and support among the pilot teachers throughout the year using the IMYM Online Learning Community. The IMYM project leaders used the self-assessment rubrics that were previously completed by the pilot teachers, and their own experience as teachers, to carefully construct this pilot study and the following professional learning experiences.

3.4.1 Day 1: Tuesday, August 26, 2003

As the pilot teachers arrived, they were greeted with five pre-arranged centres. These centres model the use of IMYM learning centres that encourage independent learning in the IMYM classroom. The centres were

- name tag centre
- coffee mug centre
- binder reminder centre
- digital camera centre
- parking lot centre.

Each pilot teacher received a name tag which was worn throughout the entire three day session to encourage teachers to build relationships. The coffee mug centre provided refreshments and a re-usable "Grass Roots" coffee mug to encourage a personal commitment to sustainable living both during the PL sessions and throughout the entire *Climate Change* pilot. The binder reminder centre provided each pilot teacher with a binder of information concerning the *Climate Change* pilot study as well the *Climate Change* interdisciplinary unit. Pilot teachers were encouraged through the PL sessions to organize and personalize the interdisciplinary learning experiences in this binder in preparation for their classroom and students. This task models OLE.1 *Personal Binder Reminder* where the learning objective is to organize and maintain work in an OLE personal binder.

The digital camera centre allowed the teachers to pick up their digital cameras and familiarize themselves with its features as they took photos of each other to use in the ICT.3 *Riddle Me This* email strategy where the learning objective is to write, send, receive and reply to emails. An accomplished digital camera user assisted with any questions and modeled ICT.7 *Caught In Action* where the learning objective is to use a digital camera and/or a video camera to collect primary data to support learning. Finally, in the parking lot centre pilot teachers recorded any thoughts, concerns or questions on chart paper for the entire group to see. The questions were gathered by the project leaders and answered throughout the session.

After introductions and an oral walk-through of each centre, the purpose and agenda of this face-to-face workshop were reviewed and focused around four main themes

- content of the draft IMYM *Climate Change* interdisciplinary unit (see Appendix A)
- methodology of interdisciplinary and collaborative instruction and assessment in the IMYM model
- pedagogy and management of using ICT to enable learning in the IMYM classroom
- functionality of the IMYM Online Learning Community pilot environment.

The icebreaker involved the use of the IMYM Online Learning Community as a means to familiarize the pilot teachers with the online environment and with one another. Each teacher provided clues about him/herself to the group through an email message on the *Discussion Board.* Later, the pilot teachers emailed each other to ask questions and to match clues with identities (ICT.3 *Riddle Me This*).

After viewing a brief demonstration of concept mapping software (i.e. *Inspiration*) to brainstorm how the teachers were already using ICT in their classrooms, the pilot teachers created concept maps on how they thought the IMYM model might look, feel, and sound within their own classroom. This strategy was particularly informative as it was repeated at the follow-up session (February 2004) for comparison. Many of the teacher's initial perceptions of the

IMYM classroom became more detailed in their follow-up concept maps. Below is a list of what some of the pilot teachers indicated in August 2003, before the commencement of the pilot study. In the right column is the list of what these same pilot teachers stated in February 2004, after the completion of the pilot study.

What your IMYM Classroom Looks/Feels/Sounds Like?	**August 2003 (prior to pilot study)**	**February 2004 (after pilot study)**
Looks	• small group demonstrations • sharing • whole group • learning Centres • presentations • review • instruction • computers • groups	• technology present • organized • groups • learning centres • different tasks to suit different needs • students active • me circulating around the room • lots of things on the go at once • computers in use • small groups (frequently changing)
Feels	• organized • busy • proud • excited being there • warm • friendly • sharing ideas • laughter • noise	• frustration • progress • feels good • successes • talking • laughter • visiting • off-task noise • questions • paper shuffling • focused voices • peer tutoring

Sounds	• enthusiastic • exciting • noisy • quiet • successful • welcome	• discussions • busy • movement • peer help • collaborating • sharing • active • motivating • life long learning • panic • accomplishment • confidence • rewarding • overwhelming • confusing • exciting

Table 1: Comparison of August 2003 with February 2004 Concept Mapping Professional Learning Activity

After the concept mapping and sharing, the pilot teachers formed small groups to become familiar with communicating within the IMYM Online Learning Community and using ICT with curriculum. This task correlates with both ICT.3 *Riddle Me This!* and ICT.6 *Inspired* where the learning objective is to use concept mapping software to organize information. The pilot teachers were required to solve a puzzle of identifying the other pilot teachers by creating and replying to email messages. By providing the pilot teachers with the opportunity to become familiar with the IMYM Online Learning Community and two of the learning experiences (ICT.3 and ICT.6), it was hoped that the IMYM Online Learning Community would be used more frequently and that ICT.3 and ICT.6 would become easier to implement within their own classrooms.

The next task involved activating the pilot teachers' prior knowledge about climate change by completing an online quiz within the IMYM Online Learning Community called the "Climate Change Challenge". The pilot teachers used their personal online learning journal to record their answers to the following questions: What do I know about climate change? How will

I use the *Climate Change* Challenge in my classroom? This task directly relates to OLE.8 *Reflection Journal* where the learning objective is to reflect on learning in a journal and to the Module 1.1 *The Big Picture* where the learning objective is to identify the importance of citizenship, their roles and responsibilities as global citizens, and aspects of sustainable development.

At the conclusion of Day 1, the teachers completed an online exit slip on what they had learned about the four themes, as well as provided feedback on the strengths and challenges of participating in the IMYM Online Learning Community. Homework was to familiarize themselves with their new digital camera and charge their batteries (both literally and figuratively).

Following are some comments of the IMYM pilot teachers concerning their experiences on Day 1 of the orientation.

> *Wow, it is amazing how quickly we can jump right back into learning after a summer of leisure. I've had a great day, I've learned a ton. I learn by doing and today there was a lot of that. I'm looking forward to keeping in contact with this group from all over Manitoba. Inspiration looks great, easy to use, somewhat. I'm hoping we can review it. I enjoyed the "discussion part of our mail". Hopefully this will become familiar quickly (personal communication, IMYM pilot teacher, August 26, 2003).*

> *I have worked with the IMYM model before, but this interdisciplinary unit is very interesting and I can't wait to try it out. I'm pleased with today's session because I have learned a lot. Although I'm familiar with IMYM, there are many things that are new to me. I'm still learning. I find this group to be open to sharing and the teachers seem to be very co-operative. I can't wait to use the IMYM Online Learning Community. I have not been teaching this way for years (change of school and the rotation system made it harder to use the IMYM model). I am a bit rusty in some areas but I have learned a lot...things are coming back. I am willing to help out any way that I can (personal communication, IMYM pilot teacher, August 26, 2003).*

> *I was concerned about being able to keep up with the technology but I have found that I am more "computer literate" that I thought. I have not been a pilot teacher before and I am excited about what I have learned so far with regards to WebCT*

> *and group discussions. I think this is going to be a valuable tool during the program. I have found that there is quite a bit of overlap between the IMYM strategies and the ones I already use in the classroom, but as you participate in them instead of facilitate them you learn different ways of using the strategies (personal communication, IMYM pilot teacher, August 26, 2003).*
>
> *There is a lot of information to be learned in a small time frame. I see one of my strengths as being able to utilize and integrate technology within the curriculum once I have built up a certain level of skills and comfort. I also enjoy collaborating with other people. It will be a challenge to learn to use all the tools that will be presented by the end of this session. I'd like to think that I'll continue to be a lifelong learner as far as ICT is concerned (personal communication, IMYM pilot teacher, August 26, 2003).*

3.4.2 Day 2: Wednesday, August 27, 2003

Day 2 had four segments. Segment one began with a reminder of what was learned on Day 1 and then continued with a jigsaw strategy around the five IMYM Professional Learning Centres (see Section 2.7). The pilot teachers organized themselves into five groups of two or three, with teachers they had not yet worked with. Each group participated in and discussed one of the five IMYM Learning Centres (Collaboration, Independent Learning, Authentic Assessment, Interdisciplinary Approach, and IMYM Classroom Set-up). The objective of this task was to have each group work through a Learning Centre and then share with the other groups their findings on the characteristics of the IMYM model. This task modeled OLE.5 *Share the Learning* where the learning objective is to share what is being learnt with others.

Segment two allowed pilot teachers to familiarize themselves with the structure of the *Climate Change* interdisciplinary unit (e.g., OLEs, ICTs, and Modules 1-4). This task correlates with Module 1.1 *The Big Picture,* where teachers identify the importance of citizenship, their roles and responsibilities as global citizens, and aspects of sustainable development with their students. Collaboration, networking, becoming more familiar with the *Climate Change*

interdisciplinary unit and with the IMYM model were all designed to prepare the teachers for their pilot experience.

The Jigsaw Learning Centre on the *Climate Change* interdisciplinary unit was the third segment of Day 2. To make this task manageable and to model the IMYM characteristic of collaborative learning, pilot teachers were divided into six groups. Each group examined one component of the *Climate Change* interdisciplinary unit and created a PowerPoint presentation to introduce that component to the whole group. Teachers researched the following questions.

- What is the overview of the component?
- When in the school year is the component completed?
- What are students doing in the learning experiences of the component?
- What connections are there to the culminating performance task of the *Climate Change* Awareness Week?

As a classroom management strategy, the ICT self-assessment rubrics that were previously completed by the pilot teachers were used to identify six teacher participants with enough PowerPoint experience to act as 'group encouragers', or peer mentors. This task models ICT.8 *Make Your Point* where the learning objective is to create multimedia presentations and OLE.6 *Collaborative Learning* from the interdisciplinary unit where the objective is to experience roles, responsibilities, and expectations of collaborative group work.

The fourth segment of Day 2 was learning how to use the *Sharing Centre* within the IMYM Online Learning Community. After a demonstration, each group uploaded their group IMYM PowerPoint presentation to the *Sharing Centre*. Becoming familiar with the *Sharing Centre* was important so that pilot teachers would have the skills necessary to share student samples and classroom photos with each other throughout the pilot.

The IMYM *Climate Change* pilot teachers were asked to fill in an exit slip evaluating their learning experiences on Day 2. There were a total of six statements in which they were asked to respond to.

1. My participation in the learning centres on the IMYM model helped increase my understanding of the 5 characteristics of the IMYM classroom – interdisciplinary learning, use of learning centres, collaborative learning, authentic assessment, and flexible classroom setup.
2. After participating in the Delving Deeper 'fill-in-the-blanks' task, I feel more confident in my understanding of the structure and content of the 6 components of the *Climate Change* interdisciplinary unit.
3. Through the demonstrations and my hands on use of *Inspiration*, I feel prepared to use concept mapping software with my students this year.
4. I am becoming more comfortable with my role as a pilot teacher.
5. I am beginning to feel like part of the IMYM Learning Community.
6. I believe I will be able to give and receive help during this IMYM pilot through use of the IMYM Online Learning Community.

For question 1, six of the fifteen respondents significantly agreed while eight greatly agreed that their knowledge of the five characteristics of the IMYM classroom has increased due to their participation in the various learning centres. For question 2, twelve of the fifteen respondents said that they were not at all confident of the six components of the *Climate Change* interdisciplinary unit. For question 3, seven of the fifteen respondents significantly agreed while seven greatly agreed that they felt prepared to use concept mapping software such as *Inspiration* in the pilot study. For question 4, ten of the fifteen respondents significantly agreed while two greatly agreed that they were feeling more comfortable with their role as a pilot teacher. For question 5, nine of the fourteens respondents greatly agreed while four significantly agreed that they felt part of the IMYM Learning Community. For question 6, seven of the fourteen respondents significantly agreed while five greatly agreed that they were able to give and receive help through the use of the IMYM Online Learning Community.

After completing the exit slips, the pilot teachers were given homework. The homework was to use their digital camera (ICT.7 *Caught In Action*) to collect images that would represent some aspect of climate change (e.g., weather phenomena, clouds, recycling, energy conservation, transportation, appliances, etc.). The purpose of this task was to assist the pilot teachers in learning more about their digital camera while also getting them to start a collection of copyright-free digital images to share through the *Sharing Centre*. This collection will eventually be made available to all Grade 5 teachers implementing the *Climate Change* interdisciplinary unit.

Following is a comment some of the IMYM pilot teachers concerning their experiences on Day 2.

> *The materials and information available for use on the Climate Change interdisciplinary unit will be invaluable to me as a first year Grade 5 teacher…this year especially. The IMYM model is very new to me and will require time to process and reflect on how I can change current practices to integrate this new standard of educational thinking. I have learned and will continue to learn much more, I know, on the IMYM Online Learning Community in particular, and technology in general. I am looking forward to planning and implementing this project at school. I will be working with students that are known to me from last year and think that they will enjoy the learning opportunities that the IMYM model will present (personal communication, IMYM pilot teacher, August 27, 2003).*
>
> *Today was a little overwhelming with all the info, but I am keeping an open mind and ready to continue learning (personal communication, IMYM pilot teacher, August 27, 2003).*
>
> *It was another great day. I felt my head go under water a few times, but I didn't run out of breath. I'm very excited about starting this unit. I need to get a few more things organized in my head first, but I know there's a great support team to help out (personal communication, IMYM pilot teacher, August 27, 2003).*
>
> *Great day ladies. Loved the hands-on activities. Yes I am beginning to feel the impending pressure on the work load (personal communication, IMYM pilot teacher, August 27, 2003)*

> *I am very excited about working on this unit with my students and these professionals. I am also interested to see how Web CT allows the teacher participants to work collaboratively compared to past pre web ct IMYMs. Thanks for the opportunity (personal communication, IMYM pilot teacher, August 27, 2003).*

3.4.3. Day 3: Thursday, August 28, 2003

Day 3 was the last day of the face-to-face professional learning orientation. After welcomes and a review of what was learned the previous day, each group assessed the different resources provided on their *Climate Change* CD-ROM. The pilot teachers accessed either *Hot Potato* or the *Millionaire Game* in order to create a game with the climate change facts that they had gathered the previous day. This task relates to two *Climate Change* learning experiences: M2.4 *Sharing the Consequences* where the learning objective is to create poster and games that share the consequences of climate change and M3.6 *We All Can Make a Difference* where the learning objective is to collect previous work already completed and then create products to educate others about how we all can work together make an impact on climate change.

Next, the IMYM pilot teachers learned about creating a personal web page. This task models ICT.11 *Making It* which learning objective is to create a Scavenger Hunt and a class website. The pilot teachers then watched a brief demonstration on how to download a zip file from the IMYM Online Learning Community and upload it to the *Sharing Centre*. Then the pilot teachers learned how to “un-zip” a file within WebCT.

The next assigned task was designed to help the pilot teachers take a closer look at the *Climate Change* interdisciplinary unit. This was done by using "fill-in-the-blanks" concept map to visualize the structure of the six components. Each concept map for OLE, ICT and Modules 1-4 has the main idea in the centre and a symbol for each learning experience linked to it (see Figure 3). On each symbol is the title of the learning experience. Each learning experience has a

symbol that links to a learning objective. Working in pairs, the pilot teachers examined the *Climate Change* learning experiences to gather the information needed to fill in the blanks on each of the six concept maps using their concept mapping software. This task provided practice in using *Inspiration* (ICT.6 *Inspired*) while forming a clearer understanding of the structure and content of the *Climate Change* interdisciplinary unit (see Appendix H for all concepts maps).

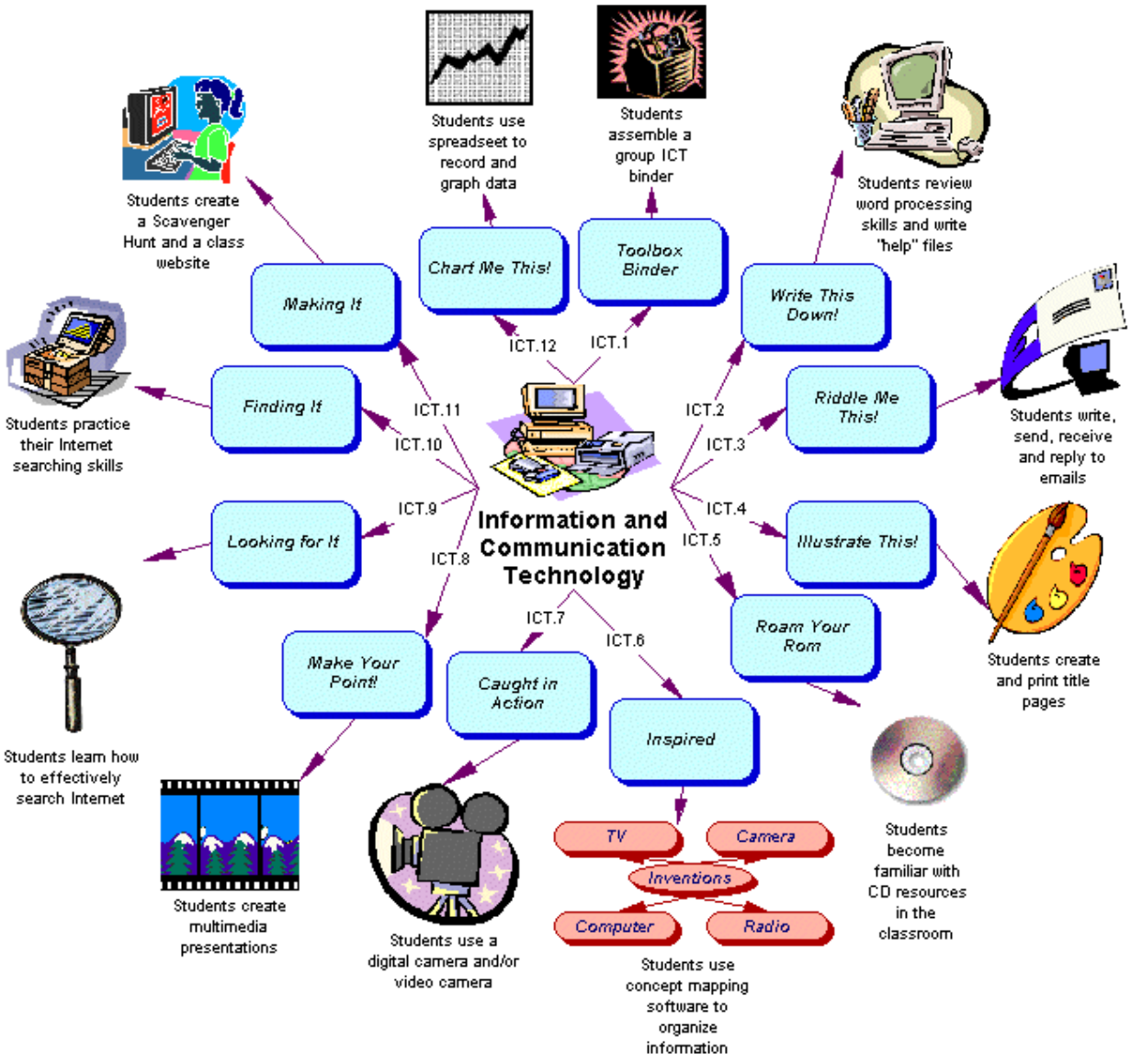

Figure 3: Concept Map of ICTs

The pilot teachers then independently completed a *Scavenger Hunt* in order to learn more about the *Climate Change* interdisciplinary unit and the resources available to them and their students. This task modeled a strategy from learning experience ICT.10 *Finding It: Internet Scavenger Hunt*; the learning objective being to improve Internet searching skills.

One incentive for becoming an IMYM pilot teacher was receiving a digital camera for classroom use. Therefore, the pilot teachers needed to learn how to use the digital camera and the accompanying software. A demonstration illustrated how to install the digital camera software (*Zoombrowser EX*), how to download images from the digital camera to a computer, how to re-size images for the Internet or email, and how to upload digital images to the *Sharing Centre* within the IMYM Online Learning environment. These tutorials were also provided in the online *Techie Toolkit*.

During the IMYM professional learning sessions, no task was complete unless *Share the Learning* occurred (OLE.5 *Share the Learning*). To share the learning for this task, the pilot teachers

- installed the digital camera software
- connected the digital camera to the computer
- uploaded and re-sized the digital images they had taken from their assigned homework to the *Digital Images* folder in *Share the Learning*
- sent an email to the IMYM project leader describing the location of the image, the file name, and how they thought it could be used in the *Climate Change* interdisciplinary unit
- accessed the other pilot teachers' digital images from the *Sharing Centre.*

The pilot teachers were also reminded of their role and responsibilities to

- Contribute – to the IMYM Online Leaning Community
- Experiment – with the IMYM Model and the *Climate Change* Interdisciplinary Unit
- Discuss – with other pilot teachers
- Share – student samples and digital photographs
- Reflect – on their own learning, professional relationship, and classroom changes

- Provide Feedback – by completing online Exit Slips at the end of each *Climate Change* learning experience.

The final portion of Day 3 was dedicated to reflecting on the last three days, discussing what was learned, planning for the pilot in terms of re-structuring their classrooms, getting started, and so forth. The IMYM *Climate Change* pilot teachers were asked to fill in an exit slip at the end of Day three. They responded to five statements.

1. After uploading my digital picture, I now know how to share my student samples through the IMYM Online Learning Community.
2. Through the Learning Resources Jigsaw task, I feel I have an understanding of the variety of print, software, and online learning resources available to me for the *Climate Change* pilot.
3. After participating in the Learning Resources Jigsaw *Share the Learning*, I now know how to conduct an Electronic Gallery Walk using *Inspiration*.
4. After charging the batteries, taking some pictures, and using the digital camera software, I am confident that I can use my new digital camera to take pictures that represent some aspect of climate change, such as weather phenomena, clouds, recycling, energy conservation, etc.
5. After completing this 'quiz', I am prepared to answer similar 'quizzes' following the completion of each *Climate Change* learning experience.

The possible answers included not at all, slightly, significantly, and greatly agreed. For question 1, eleven of the thirteen respondents slightly agreed that they would know how to share their student samples through the IMYM Online Learning Community. For question 2, eight of the twelve respondents significantly agreed and three greatly agreed that they understand the variety of print, software and online learning resources available to them in the IMYM *Climate Change* pilot study. For question 3, six of the thirteen respondents greatly agreed while five significantly agreed that they knew how to use the software *Inspiration* at the end of Day 3 of the orientation. For question 4, eleven of the thirteen respondents greatly agreed that they could use their digital cameras while for question 5, eight of the thirteen respondents greatly agreed and four significantly agreed that they were prepared to complete similar "quizzes" in the future.

After completing the final exit slip, the pilot teachers went in separate directions around the province to begin the *Climate Change* pilot study at their respective schools. Here are some comments from IMYM pilot teachers on the final day of the orientation.

> *It has been a great three days…a little heavy near the end of each day. Good luck everyone! I now have to process all this information and plan for day 1 Sept. 3. Thanks. (personal communication, IMYM pilot teacher, August 28, 2003).*
>
> *This has been really fun! I am looking forward to getting started. Thanks again for everything. (personal communication, IMYM pilot teacher, August 28, 2003)*
>
> *There is a lot to learn but I am eager to become more knowledgeable in technology (personal communication, IMYM pilot teacher, August 28, 2003).*
>
> *This is a lot of information to process. I am less anxious about certain things; I am more confident and ready to try things out. I am positive that things will fall into place once I start using the information (personal communication, IMYM pilot teacher, August 28, 2003).*

3.4.4 Follow-Up: Monday, February 23, 2004

The follow-up was scheduled for February 23, 2004, and mirrored the same format as the August 2003, professional learning sessions. The four themes (e.g., the IMYM model, the *Climate Change* interdisciplinary unit, the IMYM Online Learning Community, and the ICT integration) were discussed and analyzed in order to determine changes that were needed. A *Carousel Brainstorm* was conducted, where the pilot teachers broke into focus groups and recorded on a piece of chart paper that was labeled at the top with one of the four themes. Each group of pilot teachers wrote a sentence description of the assigned theme using a different coloured marker. Below their description, they drew a t-chart with "Successes" written on the left side and "Challenges" written on the right side. To make this brainstorming activity a "carousel", each chart was passed clockwise to the next group in order for new ideas to be added. As the charts were passed, it was easy to see the ideas contributed by each colour group. The results of are detailed in Section 4.3.5.

The second task for each individual pilot teacher was to complete a concept map of what their IMYM classroom, looked, felt and sounded like. These concept maps were later compared to and contrasted with the concept maps completed in the August 2003 orientation (see page 30-31). After this was complete, the pilot teachers entered a discussion topic in the IMYM Online Learning Community and provided advice to future IMYM *Climate Change* teachers. Here are is a list of advice from some of the IMYM pilot teachers

- Take time to review the interdisciplinary unit.
- Choose the ICTs and OLEs you'd like to do with your students and teach them prior to starting the Modules.
- Do not feel that you have to complete every learning experience in the entire unit.
- Keep in touch with an IMYM teacher that has completed the unit.
- Have a back up activity in case of technology problems.
- Have a few ongoing activities so that students always have something they can keep involved in when they have completed given assignments.
- Do some teacher-direct instruction and/or individual work whenever you feel it is needed.
- Have a good filing system, so you know where to find everything.
- It is a LOT of work, but it's also a GREAT experience.
- Be part of a team. If you feel a bit overwhelmed or lost at first, you're just like everyone else and you'll do fine.
- You'll learn more about the all the curriculums than you ever thought possible.
- Look ahead in the pilot unit as much as you can, but mostly, you just have to jump right in and do it.
- Improve your computer skills while you teach the kids how to use the programs.
- One of the best pieces of advice I can give you is to use the IMYM Online Learning Community. It's a great way to see what others are doing and you can get and give help to others who are in the same boat as you.
- The camera is very cool. The kids will love it and so will you. There are thousands of things you can do with it.
- Learn about weather before you begin this pilot.
- Learn about the digital camera and PowerPoint so you can teach these to the children right away
- Find out in advance where your support is going to be (i.e., is there money for color cartridges? printing? guests? trips?).
- Don't try to do all of the activities. Pick the ones that you are comfortable with and prepare them at least a week in advance.
- Check the IMYM Online Learning Community at least once a week.
- Try to figure out what is expected before you begin each learning experience.
- Know your students before you begin grouping them.

- Be fair with assessment and recognize the hard workers in each group.
- Give a mini workshop at a staff meeting so that the other teachers have a sense of what is going on.
- Get the kids out and into the environment as much as possible don't keep them at a computer.
- Have the kids teach other kids the skills that they have acquired.
- Be flexible…Teach the kids to be flexible.
- Ask the librarian to help you find and locate resources. Do this in advance so that you can just turn to the materials when needed.
- Keep a lookout for related activities (i.e. PolarHusky.com has a team of dogsledders who are traveling from Yellowknife to Nunavut in search of climate change evidence and interviews with the elders. They have set it up for teachers to log on with their classrooms).
- NASA is great for what is happening now with satellite photos.

The pilot teachers then took some time to reflect on how they as teachers, their classrooms and their relationships with colleagues changed over the course of the pilot study. The results of this are detailed more extensively in this report (see Section 4.4). When reflecting on themselves as teachers, the pilot teachers answered the following questions: What content and skills am I learning? What am I learning about myself as a teacher? How is my role as a teacher changing? When reflecting on their classroom, the pilot teachers answered these questions: How is my classroom changing physically and functionally? What is the impact of IMYM on my classroom practice? How are my students responding? Finally, when reflecting on relations with colleagues, the pilot teachers answered these questions: In what ways am I collaborating with other teachers? How am I mentoring my colleagues?

The pilot teachers formed groups to analyze the qualitative data retrieved from discussions in the IMYM Online Learning Community which was categorized into the four major themes. This was an opportunity for some of the pilot teachers to review what was discussed throughout the various threaded discussions.

One of the final tasks was a review and analysis of the OLEs, ICTs and Modules 1-4 to determine if any changes or deletions needed to be made for next years' teachers. The pilot teachers were asked in an open forum to answer the following questions (results in Section 4.3.5)

- What are the challenges in physically 'remodeling' your existing classroom into an IMYM classroom? What are the advantages?
- What are the challenges you found in combining outcomes from more than one subject area into a real world context? What are the advantages?
- How did you scaffold (provide support and gradually withdraw it) for your students in their development of collaborative learning skills? What behaviours did you observe that tell you that your students are becoming better collaborative learners?
- Why do you think it is important to take on more of a role as a 'facilitator and co-learner', rather than an 'expert giver of knowledge'? How did your use of learning centres provide the structure needed to transfer an appropriate amount of responsibility for their learning to your students?
- How are you expanding your own repertoire of assessment techniques and strategies to make them more 'authentic'? How are you meeting the challenges of accurate assessment of collaborative and interdisciplinary products and processes? In what ways have you assured your students' parents that authentic assessment is a valid and reliable indicator of their child's progress?
- Which LEs should we keep or remove?
- How should we change the LEs we are keeping?
- What are your strategies for use of the IMYM Online Learning Community to support you during your pilot?
- How can support provided by the IMYM Online Learning Community be made more effective for future IMYM teachers?

The last task of the day was the opportunity for the pilot teachers to share their successes with their colleagues. Teachers brought student samples, classroom photographs (see Appendix I), *Climate Change* Awareness event materials, teacher materials they had created, a link to their classroom website, videotapes of their students, and show-and-tell presentations. Many of the pilot teachers commented how helpful it was to see what the other teachers had done and how that sharing inspired them to do something similar next year.

4.0 Results

There is a substantial amount of both qualitative and quantitative data from the *Climate Change* pilot study. This data was retrieved from the self-assessment rubrics, exit slips, online feedback forms, online reflection journals, and feedback received at the follow-up session in February 2004.

4.1 Teacher Self-Assessment Rubrics

Two self-assessment rubrics were completed by the pilot teachers both before and after the pilot study. The first rubric is a self-assessment of pedagogical skills in integrating ICT with curriculum and classroom practice and the second rubric is a self-assessment of ICT literacy. Each rubric consists of descriptors of Beginning, Developing, Accomplished and Exemplary stages for each skill category (see Appendices A and B).

The *Pedagogical Skill in Integrating ICT with Curriculum and Classroom Practice* (see Appendix A) has ten ICT skills including

- using educational software
- using ICT to improve student writing
- teaching information literacy skills using resource-based learning
- teaching information literacy skills using primary sources
- differentiated instruction
- assessing student performance
- using technology for professional research and communication
- researching and evaluating the use of technology in education
- engaging in online professional learning
- setting up an IMYM classroom.

The *Self-Assessment of ICT Literacy* rubric has seventeen ICT skills (see Appendix B) including

- computer operation
- file management

- networking
- word processing
- spreadsheet
- database
- concept mapping
- graphics and animation
- CD-ROM inquiry
- Internet inquiry
- web page creation
- email
- multimedia
- digital Imaging
- videography/video editing
- Geographical Information Systems (GIS)
- Electronic data collection.

The self-assessment rubrics were completed at the August 2003 professional learning session as well as at the February 2004 follow-up session. For various reasons and circumstances, only eleven of the fifteen pilot teachers were able to complete the self-assessment rubrics both in August and in February. The results follow in graphical form.

4.1.1 Pedagogical Skill in Integrating ICT with Curriculum and Classroom Practice

Eleven of the fifteen pilot teachers completed the self-assessment rubrics of ICT integration in both in August 2003 and in February 2004. The data from these eleven pilot teachers are displayed in a double bar graph in order to demonstrate teachers' self-improvement of their skills between the two dates. The descriptions of the stages of each ICT integration skill are found in Appendix A.

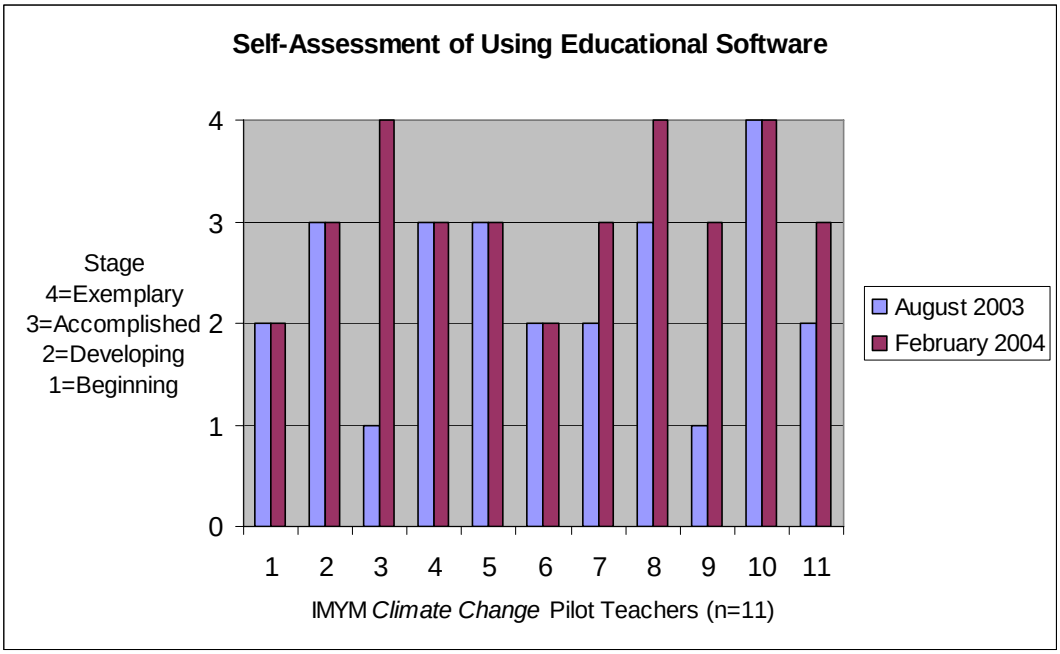

Table 2: IMYM *Climate Change* Pilot Teachers: Self-Assessment Using of Educational Software

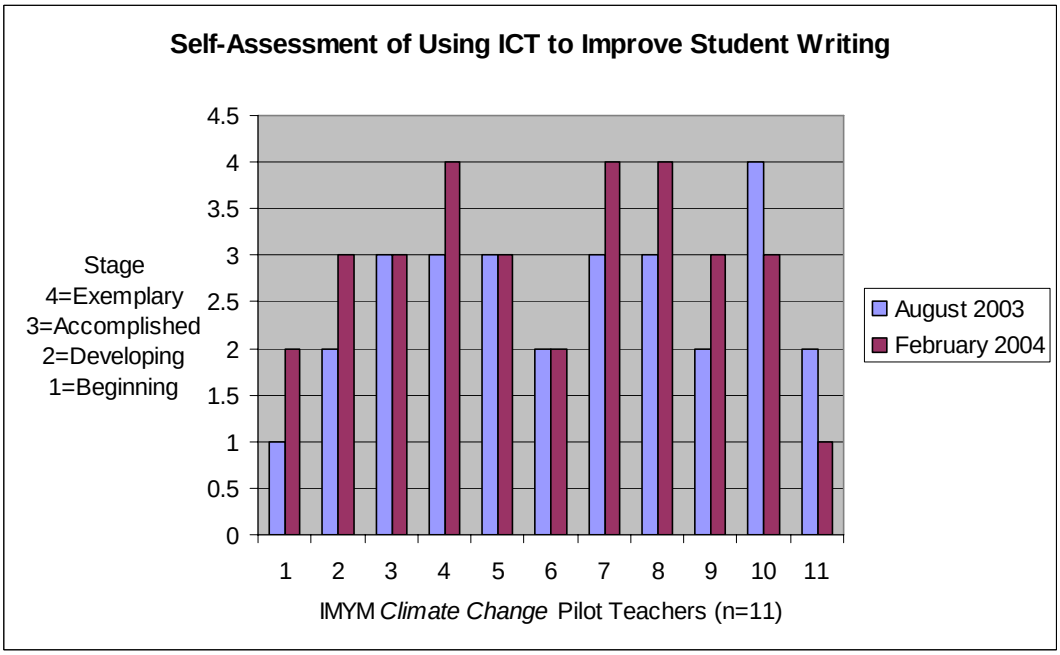

Table 3: IMYM *Climate Change* Pilot Teachers: Self-Assessment Using ICT to Improve Student Writing

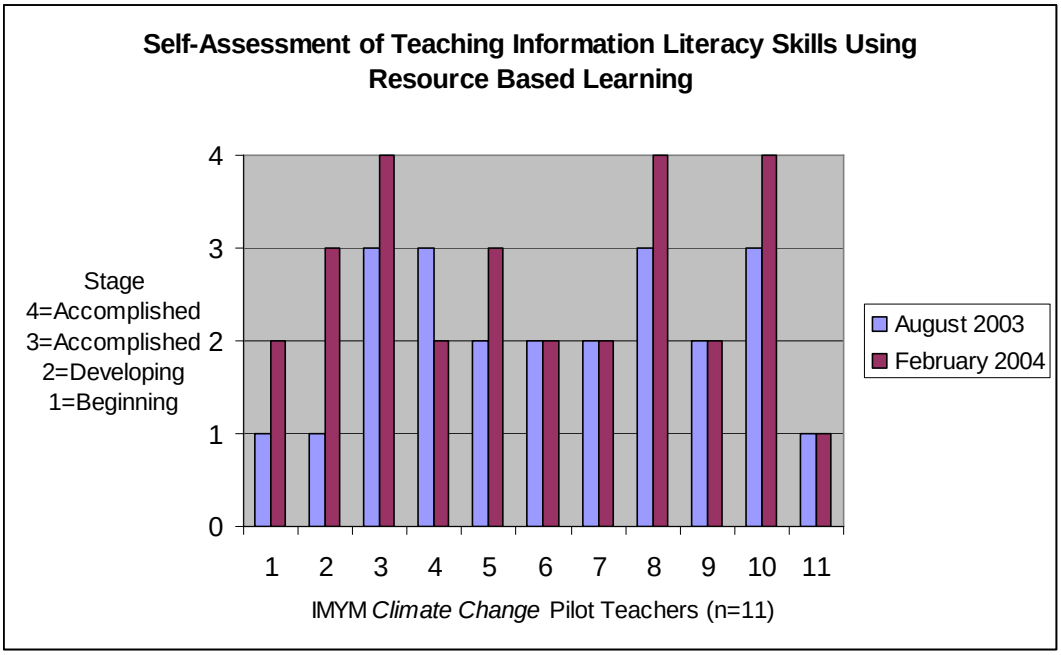

Table 4: IMYM *Climate Change* Pilot Teachers: Self-Assessment of Information Literacy Skills Using Resource Based Literacy

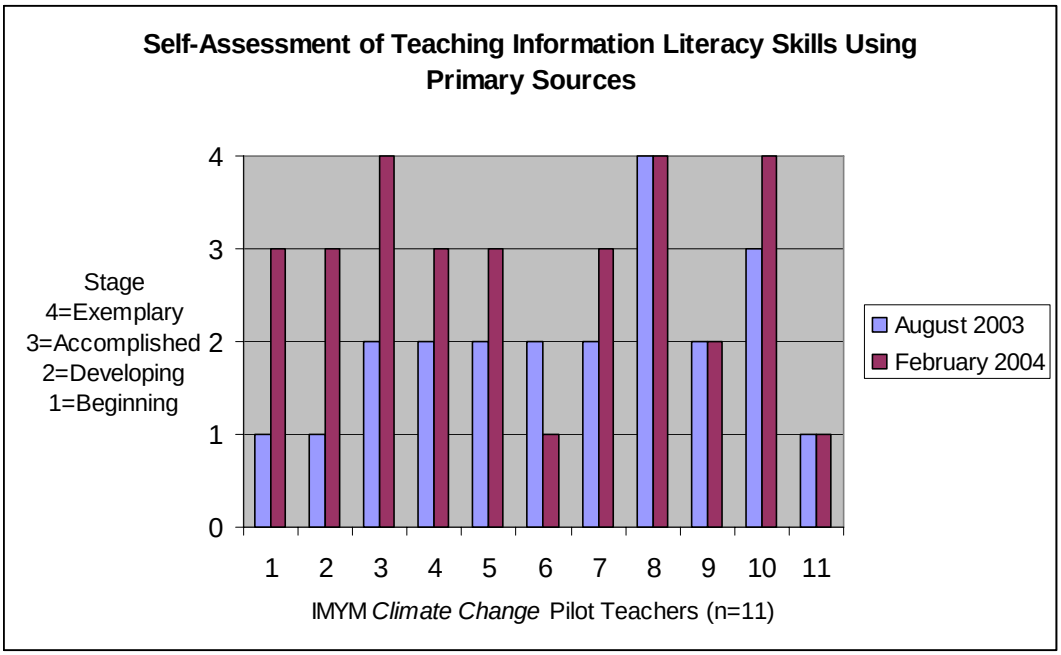

Table 5: IMYM *Climate Change* Pilot Teachers: Self-Assessment of Teaching Information Literacy Skills Using Primary Sources