



RACOL

Rural Advanced Community of Learners

**GENERAL DELIVERABLES UNDER THE CANARIE WORK PLAN:
BANFF NEW MEDIA INSTITUTE, THE BANFF CENTRE.**

1.1.1 SPECIAL SEMINARS IN FINE ARTS/ABORIGINAL STUDIES

Aboriginal interviews and content gathered for Aboriginal Studies component

1.1.1.1 Approach

In the RACOL planning retreat at the beginning of the project, we included Aboriginal participants from Aboriginal Arts and Media and Visual Arts at The Banff Centre as well as Aboriginal representation from the Fort Vermilion area. From the beginning of the RACOL program our goal was to include the Northern communities as well as Banff colleagues in the creation of content. Initially we hoped to hold a series of live events that would engage Aboriginal community members as well as students. We planned to feature artists in residency at Banff Centre who would be role models for Northern students and approach issues of interest to them in creative and social experience. We felt that these real time events would kick off an ongoing dialogue with communities in the learning context. We also determined to hire an Aboriginal consultant or work study to co-develop curriculum. It was our hope that the Fort Vermilion communities would suggest that individual. The Banff Centre as policy includes Aboriginal leads in the development of all Aboriginal content.

Over time, it was clear that we needed to shift our methodologies in the development of curriculum and in our deliverables. There was not sufficient bandwidth to connect from The Banff Centre to Fort Vermilion or outlying communities. There was no individual from the Northern Aboriginal communities who was designated to take up the development role with Banff. However, there was a teacher, Gerry Lawlor who developed Aboriginal content in the North and he stepped into the role of consultant.

1.1.1.2 Focus

There was an Aboriginal Visual Art residency, led by Aboriginal artists and cultural theorists that resident at The Banff Centre during the height of RACOL start-up. We decided that we would

approach these leading Aboriginal artists from all over the world, interview them, feature their work and create some debates between them about culture and Aboriginal identity. We worked closely with the Aboriginal residents at Banff in order to structure these interviews and discussions.

Q1: Technical specifications for RACOL streams (256K and 56k) and the technical process to get them from the raw interview footage to the streams we see on the site (banff.netera.ca) (Luke)

1. The Video/Audio was edited using Final Cut Pro 4 on a G4, 1 GHz dual processor.
2. Using Final Cut Pro 4 the progressive downloads (not streams) were created using QuickTime conversion in MPEG4 format. The 256K sequences were exported using the "DSL/Cable - High" parameter. The 56K sequences were exported using the "Modem" parameter.
3. To FTP the videos from Banff's Server to <http://banff.netera.ca> we used a UNIX Shell in Mac OSX.
4. Videos on the site are linked through Flash to appear in an HTML layer.

1.1.1.3 Design

Q2: Identify the process to which you gathered the Aboriginal Content

The Banff Centre and the Banff New Media Institute has a long and exciting history of working with the Aboriginal community across Canada and internationally. The Banff New media Institute pays special attention to ensure Aboriginal participants to our programs. We work with the Aboriginal Arts program at The Banff Centre and are in the planning stages of an issue of Horizon Zero, our web publication that will look at Aboriginal convergent media practice. We also reflect cultural difference as much as possible in our hiring policy in order to build a diverse work place that will create a comfortable learning environment for participants from diverse communities. We very consciously choose faculty who represent cultural diversity and they in turn undertake outreach on our

behalf. In our staff of 4.5 full time employees of the Banff New Media Institute, two are Aboriginal.

All of this is to say that we feel a sense of authenticity and expertise in the area of working with Aboriginal communities, designing culturally specific new media content and ensuring a strong and participatory process from the inception stage through to delivery. At the very first network meeting of the RACOL partners at Banff in 2002 we ensured the participation of a number of key Aboriginal BNMI and Banff Centre employees. They along with a member of the Beaver Lodge community and the other RACOL partners engaged in a 2 day long discussion about the purpose, design, intention, audience and pros and cons of what a Broadband project such as RACOL could mean the remote northern Fort Vermilion School District. We considered the impact and relationship across the teachers, students and community.

Following the preliminary planning meeting the BNMI continued to consult with The Aboriginal Arts program at The Banff Centre, the partners in Fort Vermilion School District and instrumentalize our own network of high end new media specialists, academics, designers and mentors.

The Aboriginal Video Series comes out of our alumni of Aboriginal participants in both the Visual Arts Residency programs and the Banff New Media Institute series of workshops, summits and special events. By process of adjudication all participants in these programs are considered to be Senior Artists in their field and their work falls under the "Best Practices" category. We approached the Aboriginal artists, requesting interviews for the RACOL project. We assigned the BNMI Coproduction Assistant and Line Producer to work with the Production Coordinator on this initiative. The Coproduction Assistant met with the Aboriginal participants to further explain what the RACOL project was, the context in which these videos would be gathered and then presented and reused. Coming out of these conversations a series of questions were developed and then used as a reference point during the "on-camera interviews". The Aboriginal participants worked with The Banff Centre staffs to interview themselves in a round table format as well as individual interviews that were conducted on a one on one basis.

1.1.1.4 OUTCOMES:

Q3: How did you achieve the deliverables?

We used pre-recorded video to present the packages to the North, creating content that could be used as asynchronous learning materials in the classroom. The resulting material is excellent and has evergreen shelf life. We have shown it to students from various reserves in Canada and RACOL teachers to positive effect have used it.

These videos support a culture of tolerance, experimentation and inquiry. They make use of the Internet as a research environment, pointing young people to the web in order to find answers to cultural questions.

We hosted a group of Aboriginal artists at the Banff Centre participating in a residency titled "Communion and other Conversations". The artists involved were first nations' artists from across North America, Australia and New Zealand and participated in the residency from October 15th to December 7, 2003.

We developed two different types of events: a round table with 4 Aboriginal artists and 4 individual interviews. The round table was a pre-recorded session conducted by Diana Pabon-Agudelo, BNMI Production Coordinator, and four artists who talk during one and a half hours about their art practice, their artwork's primary elements, and their personal experience as an indigenous person in Canada, United States, Australia, and New Zealand.

The format for the individual interviews was a short dialog between the artists and Cameron Fisher, BNMI Production Assistant, who conducted the interviews. He approached each interview with an investigative perspective, aiming to draw a unique personal response from the artists. The artists elaborated on their artistic career choices and their cultural experiences /expressions.

1.1.1.5 Individual interviews Pre-recorded Session

The following are the artists' names and short bios that participated in this session.

Terrance Houle

Born in Calgary, Alberta in 1975 he is a registered member of the Blood Tribe. Involved with Aboriginal communities all his life he has traveled to reservations throughout Canada and the United States to participate in Powwow trail dancing and other Native ceremonies. Terrence began his art career in 1995 at the Alberta College of Art and design. He graduated in April of 2003 with a BFA in Fibre after a two year hiatus from his studies. He has developed an extensive portfolio that ranges from painting and drawing, to mixed media, video/film performance and installation. His works have been shown throughout Calgary in solo and group exhibitions including exhibitions dealing with issues of discrimination. Terrence's work has been discussed in Alberta Sweetgrass, Alberta Views, New Tribe, Alberta Native News and the Aboriginal Times.

KC Adams

KC is an emerging Winnipeg artist with a B.F.A from Concordia University. Combines diverse mediums such as clay, electronics, and computer interfaces to create physical and virtual installations. Contrasting social issues faced by North American's consumerist culture inspire the content of this artwork. Has been particularly interested in the idea of polar concepts (dualism) and how they affect society on a psychological level. Has been working with the polar concepts of Nature and Technology. Website information: **www.kcart.ca**.

Jenny Fraser

Jenny works at the nexus of art, filmmaking and new technologies. Her work is exhibited both nationally and internationally - recently at Interactiva01 at the Museum of Contemporary Art in Mexico. She was also part of the curatorial working group for 'conVerge - where art and science meet' - the 2002 Adelaide Biennial. As an Artist in Residence Jenny has



created works in collaboration with the Hermannsburg Potters of the Northern Territory and Kurna Plains School in South Australia. Jenny founded and curates CyberTribe, an Indigenous Online Gallery run through Fine Art Forum -

<http://www.fineartforum.org/Gallery/cybertribe/index.htm>

Cybertribe aims to encourage the production and exhibition of Indigenous Art with a focus on the digital.

Jenny began 2002 studying a Research Masters in the area of Indigenous Uses of New Technologies. She is currently a member of the Australia Council's New Media Board.

Lisa Reihana

Lisa Reihana weaves together contemporary urban culture with Maori concepts and art practices to invent new frameworks and original forms. Variousy described as a Maori multimedia artist, experimental filmmaker, animator, video artist, installation artist, textile artist and storyteller, Lisa Reihana defies easy definition. A common thread throughout her work is the use of the sensory forms - image, pattern, textile and sound - to move across confines and to create artworks that are touchstones of a deeper cultural dynamic

Based on Gerald Taylor's and his students' suggestions we designed the following questionnaire for the individual interviews.

1.1.1.6 List of Questions for the Individual interviews Pre-recorded Session

1. What decisions does one have to make in order to become a professional artist? What do I need to do to become an artist?"
"How can I make a living through my art practice?"
2. Is art a means for you to explore and create your identity? Is art a powerful vehicle to address cultural and political issues?
3. How does your cultural background contribute to your art practice?" Through your art, do you feel that you create new platforms for cultural expression? How?
4. (After we've established each artist's practice)
 - o To TJ Houle: Why do you choose performance as a medium of expression?
 - o To Jenny Fraser: What outcome do you anticipate through the creation o



- your web sites?
 - To KC Adams: What reaction or dialogue are you anticipating through the construction of installations and cyborgs?
 - To Lisa Reihana: "How does your Maori background inform the content of your video artwork?"
5. How do you see your art practice evolving in the future? What issues do you want to pursue?

1.1.1.7 Roundtable Pre-recorded Session

The following were the artists' names and short bios that participated in the roundtable:

Sandra Hill

Bibbulmun yorga, WA) is currently Coordinator and Lecturer, Contemporary Aboriginal Arts program at the School of Art, Curtin University of Technology where she is also undertaking postgraduate studies. Hill graduated with a Diploma in Art Studies from TAFE and in 1994/5 was the recipient of an Australia Council Creative Development Fellowship. She has exhibited extensively in group exhibitions in WA since 1989 and held two solo exhibitions at the Artist in Residence Gallery, Perth in 1995 and 1997. Hill has also been involved in many public artwork commissions through murals, tile/mosaic and leadlight artworks. These include a 1997 Subiaco City Council commission, a 1998 tiled artwork in Cottesloe, a mosaic pavement for the Mandurah Heritage Art Walk in 1999 and pavement mosaics for the Graham Farmer freeway.

Bert Benally

Bert is a Dine (Navajo) from Arizona, currently resides in Shiprock, New Mexico, with his wife, Zoey and 3 kids, Kino, Tatiana and Oona. He graduated from Arizona State University with a BFA in sculpture in 1993 and got his MFA in sculpture from University of Wisconsin – Madison in 1996. He is employed as an A/V specialist with the Indian Health Service in Shiprock, N.M. developing audio and visual materials promoting health. He also teaches art classes at Dine College



(Shiprock, NM). As an artist and DJ he has collaborated with Northern Cheyenne artist Bently Spang and filmmaker Gabe Shaw, Navajo on an interactive performance piece titled "*Techno Powwow*" creating a mixed-media installation which combines techno-rave music, interactive animation, video projection, and Native American dance forms. The artists work with environments in which Native American dancers move to a mixed soundscape of techno and powwow music, and interact rhythmically with computer generated animation on rear-projection screens. Costumes worn by the performers are an amalgam of traditional powwow dress and contemporary materials.

Lonnie Hutchinson

Born in Auckland, Lonnie works as a full time multi - media artist. She appears under the different guises of painter, screen-printer, sculptor, installation artist and performer. She hold a degree in spatial design and sculpture from Unitech and is a practicing art teacher. Lonnie has exhibited in many exhibitions and is currently the Macmillan Brown Pacific Island artist in Residence at the University of Canterbury.

Skawennati Tricia Fragnito

A former artist and independent curator, Skawennati now prefers to think of herself as a content provider. Working with new and not-so-new technologies, she has been involved in a wide range of projects whose aim is to distill meaning from the vapour of nuance. In 1996 she initiated CyberPowWow, an international online event that takes place every two years, and during which digital artists and writers contribute to a virtual gallery and chat space. While Curatorial Resident at the Walter Phillips Gallery at The Banff Centre for the Arts, she mounted *Blanket Statements*, an exhibition of art quilts, and *The People's Plastic Princess*, a survey of more than thirty years of Barbie art. During her two-year stint in San Francisco, Skawennati produced Arts Alliance Laboratory's monthly CRIT (Critical Reviews of Interactive Technology) nights and was invited to co-curate "New Fangle" for GenArtSF. Recently she launched Artist for the Ethical Treatment of Humans, her own personal subvertisement campaign, and now she is quite excited about a web-based digital-video jukebox called



80 Minutes, 80 Movies, 80s Music. Please visit www.skawennati.com to learn more.

Based on Gerald Taylor and his group of students' suggestions we designed the following questionnaire for the roundtable pre-recorded session.

1.1.1.8 List of Questions for the Roundtable Pre-recorded Session

Short introduction by each artist

What decisions does one have to make in order to become a professional artist?"

Is art a means for you to explore and create your identity?

Is art a powerful vehicle to address cultural and political issues?

How does your cultural background inform the content of your artwork? (Themes/ideas that you explore in your artwork) – Four Seasons/ Four Directions/ Circle of Life/ Spirit world of aboriginal societies

1. Do you use Cultural Iconography to express your ideas?
Through your art, do you feel that you create new platforms for cultural expression? How?
2. What reactions or dialogue are you anticipating through your artwork?
3. How do you see your art practice evolving in the future?"
What issues do you want to pursue?
4. How can you make a living through your art practice?

Q4: Describe the relationship with Gerald Lawlor and how that influenced your approach and particular information you gathered from the aboriginal artists.

For developing a real time Aboriginal curriculum support about creativity, culture and leadership, our main contact was Gerald Lawlor at the schools in Fort Vermillion, Fort Public, Rainbow Lake, La Crete

and High Level. He is a teacher of Aboriginal Arts and he provided us with a list of topics, which the Aboriginal artists could speak about. Our target audiences were seventeen students in each school, most of them at the grade 10 level.

The following were the topics Gerald suggested we needed to address in both, the individual interviews and the round table:

- 1) AB spirituality as expressed in AB art forms. This topic explores the nature/definition of spirituality and how it is communicated, celebrated and passed on through art. In this case how and what the artist was inspired to express in his/her art form.
- 2) Exploration of common themes expressed in AB art:
 - Four Seasons
 - Four directions
 - Circle of Life
 - Spirit world of AB societies
- 3) Role of art in transmitting traditional values, beliefs, history and AB culture generally, and how AB art expresses the traditional AB relationship with nature and the natural/supernatural world.
- 4) Presentation and discussion of past/present AB artists who have contributed to AB art movement and or impressed/inspired the artist (accompanied by a visual presentation of their art).
- 5) Survey of AB art media; sculpture, poetry/writing, painting, clothing, beadwork, dance, song, storytelling and creation stories (accompanied by visual presentation of examples for each medium)
- 6) Information on art as a career choice and reflections by the artist on their personal roles in representing, preserving and developing AB culture.

Also, Gerald forwarded to us a simple questionnaire that he and his students developed to pose to the artists regarding the role of the Aboriginal artists:

- 1) How do you see your role as an artist in society?
 - To reflect what is happening in society to allow us to see ourselves



- To act as a spokesperson for Aboriginal peoples
 - To create beauty
 - To get people to think
- 2) How much does coming from an Aboriginal heritage influence your work? Can you give us an example?
 - 3) What are some of the themes/ideas you explore in your art work?
 - 4) In what ways do you hope your work influences the person who sees it?
 - 5) If someone said you could only ever again see one of all your works of art. Which one would you decide to see and why?
 - 6) What specific aboriginal symbols, themes, historical events and issues find their way into your art?
 - 7) Could you please provide us with specific cross-cultural examples of your artwork?

Gerald Lawlor's points of view, suggestions and concerns were very important to us when considering who the best people to invite to both sessions were and how to conduct the interviews. The feedback from the students and their expectations were highly important, this helped us to better understand how to provide them with a final product that would fulfill their expectations.

1.1.2 ACHIEVEMENTS/CHALLENGES:

We followed protocol in working with Aboriginal artists at Banff, that is, giving them control over content. The RACOL project, including Banff did not fully observe protocols in working with Aboriginal communities, that is, engaging the community leaders or representatives in the production of content, although attempts were made. When true collaboration occurs, the communities "own" the content and provide excellent advice on what relevant and appropriate. There were several attempts to meet with communities, including a trip North led by Diana Pabon-Agudelo and invitations to Banff. Sadly, because of the minus fifty-degrees weather the Aboriginal leaders and our team was unable to meet, as community leaders could not leave the reserve. However, the larger reality was that the project focused more on the production of gaming content and Aboriginal materials, while produced, were a second phase of the endeavor.



The Aboriginal participants at The Banff Centre were very concerned that there was not a representative from the Northern communities that was part of developing the learning materials. As well, some of the game designers expressed concern that there was no discussion with the Aboriginal communities that would also be using the games they were creating, since Aboriginal communities were such an important part of the student population. However, Aboriginal artists at Banff did participate in creating material, developing their sense of relevant issues that might interest Aboriginal youth from an international perspective. The resulting materials are excellent and engaging, despite the structural challenges in their production.

Q5: Could you describe any technological innovation within the context of education or training?

The idea of producing a series of interviews and discussions with First Nations artists not only developed a real-time network collaboration to support the Alberta Aboriginal Studies Curriculum, but also permitted the use of the Internet as a research environment pointing young people to the web in order to find the answers to cultural concerns. The technology used was standard, but what we consider a real innovation within the context of education, was to bring together international and cross-cultural perspectives from Aboriginal creators from within and outside Canada. This created a series of resources and interactive experiences that brought a tremendous educational experience to youth in Alberta in a form that inspires them to learn, ask questions and explore.

Q6: Did you use broadband technology?

A: Broadband was used for the video conferencing across the Internet.

Q7: Were there any technological barriers to producing these special seminars for RACOL?

We had several technical problems that prevented the videos from being seen by the students in class. The Quick Time Plug-in required to

view the videos on the classroom computers was not properly installed in all the schools and the schools had to address an audio coding problem. In the learning suite at the Schools, the audio had to be altered in order to allow the audio to play over the room speakers. It was not a problem with the videos themselves but how the equipments at the schools were configured. The issues were fixed but not on time for the students to see the videos during class time.

In addition, group meetings were held via video conferencing bi-weekly between the RACOL and U of A. These bi-weekly meetings were held using the minimum standards associated with video conferencing and still we were getting video feed fewer than 10 frames per second and audio wasn't high quality. However, with Fort Vermillion it wasn't possible to connect through the Internet because of a lack of bandwidth coming into Banff. Since we are not connected to SuperNet the flow of information is not fast enough to maintain video conferencing connection outside The Centre.

1.1.3 LESSONS LEARNED AND RECOMMENDATIONS

Q8: What recommendations would you have for improvement?

We suggest that future endeavors include Aboriginal representatives from the Fort Vermilion area in the development of curriculum materials. In general, this requires intensive focused effort. Hiring an Aboriginal team member is the way to ensure that these relationships are constructed.

As well, there is a great opportunity in involving Aboriginal youth and teachers in game development and production. Games are part of many Aboriginal cultures and in fact, there are several international initiatives in Aboriginal games development that Banff is engaged with. Students from Aboriginal communities (Morley) who user tested the games were very enthusiastic and had ideas as to how to include their cultural content in the games. We would suggest that attention to developing an Aboriginal game would be exciting in the future.

1.1.3.1 Other Special Seminars: Science Toys

While Banff was developing the RACOL games and the Aboriginal video materials, we also videotaped interviews with leaders in science and new media, developing them for web-based delivery through our Science Toys (ASRA) project. These are again an excellent resource for teachers who want to establish the importance of science studies, career opportunities and current debates in science. For example, there is a discussion about nano technology and ethics that is of deep relevance to science studies at Grade Eleven and Twelve. There are women scientists who serve as role models for girls who might be thinking of future careers.

Q9: What were the lessons learned in the overall process of developing the seminars what would you do differently next time?

We have some concern that we have failed to adequately integrate this excellent material into the resources that RACOL teachers are aware of, which would be a terrible lost opportunity and resources. I hope that as the project winds down The Banff Centre and RACOL leadership team in Edmonton and Fort Vermilion let teachers know about the resource and Science Toys web site.

See section of on games curriculum development re video conferencing.

1.1.4 INFORMATION DISSEMINATION

Q10: Description by which you had a chance to share RACOL developments with a wider audience.

Both pre-recorded video sessions featured short pieces (video and/or photos) of each artist's own new media work. The shorts were edited as 5 minute interviews and then posted on the web, accessible to the teachers to use at their own convenience. The videos can be seen at: <http://banff.netera.ca>

Science Toys Materials should be considered as a part of the overall deliverables that RACOL can use as its completed package, as The Banff Centre saw this material as relevant to RACOL and made sure that the final videos can be delivered over the Internet.



1.2 COURSE DEVELOPMENT

1.2.1 Physics games developed to support Physics 20/30 curriculum

Q1: Design, process/journey, working with “baby researchers”, the achievements/challenges, how the games development were shared with a wider audience outside of the RACOL team (i.e. Bow Valley, Quintessence, Beauty of Collaboration).

1.2.2 Goals and Approaches

The rationale for games developing is discussed at the outset of this text in **Role of The Banff Centre: Overall Approach and Goals**

. To summarize:

- 1) Games could provide students with engaging experiences that encouraged them to approach learning physics. Learners who might not enjoy science studies would be engaged by games. Others would not only learn science through play, but would understand how physics and math are part of game development.
- 2) Games could provide teachers with assets to enhance the classroom experience. Some games could be tied directly into curriculum.
- 3) Games could provide alternate study materials for the home or classroom setting.

- 4) Games that were non-violent, culturally inclusive and gender neutral might encourage a larger range of learners to be interested in science.
- 5) As well as video conferencing teaching, RACOL provided an opportunity to develop new kinds of learning objects for the on-line broadband classroom.

Our core challenge was to develop games that were truly fun to play, engaging, could cross-different populations of

players/students and would also be effective in teaching science concepts. From the beginning of the project we knew that teachers might only want illustrative learning objects. We felt that our role, as a Centre with access to games industry knowledge, design knowledge and interactive experience design was to create true games that could potentially stand alone as well as integrate into classroom knowledge. This required a CULTURAL SHIFT on the part of teachers, one that has only just begun.

1.2.3 Approach

The games content was discussed over a number of face-to-face meetings at The Banff Centre at the beginning of the project (before start up). These were seen as part of a larger map of science content that was appropriate to Grade Twelve. At the planning meeting in Banff, we drew a galaxy of content and then tried to centre in on the science issues that would be most compelling in game play. Approaches to design were discussed. While some games might tie directly into curriculum, value was seen in others working side-by-side with curriculum, teaching some general physics principles but also illustrating the importance of physics knowledge in game play. A planning team that included Dr. Jim Parker, U. of Calgary, Sara Diamond, Michael Bussiere, Carleton U. and Dr. David Geelan from U. of Alberta, was struck to begin implementation of the project.

Game development occurred in two phases over the course of the project.

1.2.3.1 Phase One

Phase One took place, using the Internet and video conferencing, between University of Calgary, Computer Science, led by Dr. Jim Parker, and Carleton University, led by Michael Bussiere and The Banff Centre. It lasted for approximately four months, with Diamond providing a face-to-face interface at U. of C. and then Carleton and participating in project evaluation. Students in classes in each location worked on games and also tried to collaborate in the development of assets. Collaboration between the two sites was actually somewhat scanty, in part because setting up video conferencing at U. of C. proved to be very difficult. However,

students developed valuable concepts and assets in each location, sketching out possible games. These courses provided the hiring framework for the young research interns who would develop the second stage of the games at The Banff Centre. Key ideas and narratives in all of the games were bubbling beneath the surface when they came to Banff. This provided a head start on game development. It also suggested that communications processes in development are always challenging and was part of why ongoing liaison with Edmonton was created in Phase Two of the project.

1.2.3.2 Phase Two

Phase Two took place at The Banff Centre. Over two months a team was created, drawing from programmer designers from U. of Calgary and Carleton who had taken game development or new media courses. The team assembled at Banff and began to plan their games, based in part on the work they had done in the previous phase of the project or games they had designed in Dr. Parker's former class. That they came in with developed ideas and even first design sketches was both strength and a liability. It gave them and Banff a starting point for the games (Erik and Dee were in part hired because their games were of interest to faculty who team-taught at U. of C.). It also meant that it was more difficult to integrate a designer and narrative development team after the fact. A positive outcome of the project is that there are elements of some of the initial ideas of the Phase One games in the current games, but with qualitative improvement on the original concept.

After approximately six weeks a games industry experienced designer joined the team, working to take the concepts and code of the programmers into visual design. Then, several weeks later, a game narrative and graphics artist, with producing history arrived. This provided a coherency to the project team, its skill set and each game. The team was off and running.

Leading games development team was a new experience for The Banff Centre, although we had taught games workshops in the past with seasoned faculty, many in BNMI play games and there was a history of game theory, inclusion of designers and companies at our Summits. We had a vast history in developing interactive media, including our success story, Horizonzero.ca. Getting the team structured, equipment to them so that they could develop, and

providing a leadership process for them was a challenge that had bumps along the way but ultimately resulted in a hybrid working method, collaboration between skill sets and a series of games. Banff has learned a great deal from this process as discussed later on in this section.

Q2: Provide details in terms of the games development process and working with the team: what worked, what didn't etc., schedule and the importance of milestones and task lists for developers.

We originally hoped to prototype six to eight games. In reality, we were able to first prototype four and bring three to near completion. For the developing process of these 3 games we worked with a group of 2 graphic designers and 3 programmers. The programmers drafted a basic idea of what they considered to be a base game concept with physics content. We then hired a story-board/conceptual designer and a digital artist. Another Programmer worked on a fourth game that was not completed as he returned to school, and the project development time lines were longer than originally scoped.

The group worked under the supervision of an on site Art Director, a Production Coordinator and a Line Producer. From U of A we had valuable help from a group of people formed by the Principal Investigator of RACOL, the Project Manager, an Educational Instructional Designer and a group of physics teachers that helped us to make conceptual clarifications in terms of the relationship between the narratives and the physics content.

By producing milestones every 3 weeks and schedules for each programmer and designer we were able to develop a methodology, which guaranteed we were able to complete our deliverables on time. We also established personal contact with the group at U of A every 15 days by video conference. During these meetings the U of A group would provide feedback on the completed milestones and provided guidance as to what the next milestones should be.

From our perspective, the schedules and milestones permitted us to maintain control and perspective over the games. This included the

game narratives, programming process, physics content, interface design and helped us to resolve conflicts in the games usability.

At the beginning it was difficult for the team to understand the “milestones” concept and how to organize their individual schedules based on the milestones. However during the process they understood how useful it was for the programmers to receive art assets at a specific and expected time allowing the team to plan their schedules according to what each member was working on. The continuous feedback between those involved in the process contributed to the success of the team and the completion of the games.

An additional dynamic was involved in the process of testing the appropriateness of the games our target audience. To accomplish this, we tested the games on four different occasions. Students in Northern Alberta, our local schools (Banff and Canmore) and an Aboriginal group of 8 students of a local community participated in testing the games. A total of 80 students tested the games in a period of 8 months and provided us with written feedback. We prepared a questionnaire for each game (please see them below), and incorporated the students’ feedback into the games. The feedback we received from the students and teachers who tested the games helped us to establish new milestones in order to improve the games playability and content.

The following are the questionnaires, which the 60 students from the Banff and Canmore high schools answered in order to give us their valuable feedback.

1.2.4 THE INFINITE PRIME

TRAINING:

1. Did you find it difficult to get into the training exercises?
2. a) Could you complete the first Q&A: Significant Digits 1?
3. b) If not was it difficult to get back to the Opening Scene?
3. Could you complete Q&A: Scientific Notation?
4. Could you complete GRAPH: Acceleration vs Time?
5. In the Q&A’s can you figure out how to add 2 , 3 , and 0 to your answers?



THE INFINITE PRIME IN GAME:

1. Did you find it difficult to locate jobs to take in the game?
2. Did you find it difficult to land on a space station?
3. Could you complete the job, Obtaining Your License?
4. Can you figure out how to refuel your ship?
5. Could you quit the game?

COMMENTS: (Please include aesthetical and playability comments)

THE INFINITE PRIME ANSWER GUIDE:

Significant Digits 1:
4, 3, 3, 2, 4, 4

Significant Digits 2:
8.5 m, 13.64 g, $3.5E3 \text{ kg}^2$, $1.95E2 \text{ cm}$

Scientific Notation:
 $5.8E3 \text{ m}$, $4.5E-4 \text{ kg}$, $3E8 \text{ s}$, $8.7E-8 \text{ m}$, $9.345E7 \text{ s}$

Unit Conversion: EASY:
 $1.1E-2 \text{ m}$, $7.43E-11 \text{ m}$, $2.8E3 \text{ m}$, $2.34E5 \text{ m}$, $8.4E-1 \text{ m}$

Unit Conversion: HARD:
 $6.25E9 \text{ m}$, $3E-11 \text{ m/s}$, $1E5 \text{ m/s}$, $2E4 \text{ kg/m}^3$

Momentum and its Fundamentals:
 0.013 s , 63 N*s , 8.5 m/s , $2.0E4 \text{ kg*m/s}$, $1.3E3 \text{ N}$

Vector Math:
1. 36 N
2. 62 N
3. 34 km/s
4. 21 km, 49° SW
5. 207 N, 53° NE



River Crossing:

- A) 18 m/s, 29° NE
- B) 8.5 s
- C) 77 m

1.2.5 GALAXY PIRATES

1. Is the interface easy to understand? (Meaning of Icons, Finding Help, Navigating the menus, etc.)
2. Is the Physics help understandable and useful? (Equations familiar, Text is easy to read and understand, etc)
3. Are the controls easy to use?
4. Is there enough time to solve the equations to destroy the enemy cannons?

COMMENTS: (Please include aesthetical and playability comments)

1.2.6 MIRROR X

1. Was the input to the game easy to master?
2. Did you find understanding the instructions to the game difficult?
3. Did you understand the physics concepts presented in the game?
4. If there was anything you could change about the game, what would it be?

COMMENTS: (Please include aesthetical and playability comments)

Unfortunately, the process of testing the games was a little late, as we had been developing the games for 3 months before we had feedback from our target audience. So the modifications were costly in terms of effort and time. However, we learnt that this was an invaluable experience and with this feedback the games actually advanced towards the real goal: To teach physics and be enjoyable to play.

Q3: Describe the technological challenges with the games development.



Choosing the medium with which to convey physics material to the students was a tough decision. There were a few development tools available, namely Flash, Java, and Director, which could deliver the product through the Internet. The games needed to have plug and play accessibility and work on Pentium computers ranging from 400 to 900 MHz. To develop a system that is to be deployed over the internet there were many new challenges that we needed to address very quickly. One was the fact that to be effective, systems distributed over the Internet have to be cross platform. Another was the fact that these systems have to take into account bandwidth issues. Additionally there was the actual method of deployment. Will the games use their own windowing system? Will they run from an Internet browser window? Or perhaps they could be a dedicated client setup. In order to address all these issues, including minimizing downtime due to learning a new programming language, each game was developed using different tools. Infinite Prime was created in Flash because the developer considered it could work relatively smoothly on the lower-end machines. Flash also had the benefit of a plug and play installment already available through Macromedia. A drawback of choosing Flash was that as a development medium it was limited to 2D, which appears basic when compared to popular games. In contrast, Mirror X was written in Java and this choice has proven to have its ups and downs. The first challenge we had to deal with was that Java is not truly cross platform. While many things work across many different implementations of the Java Virtual Machine, there remain some differences in performance. Notably a program written in Java that runs quite well on a PC well does not always perform to the same quality on an equivalent Mac based system. In addition, in order to use Java a user has to choose one of three different ways to have the system deployed. The complexity of implementing these three options required much research and time to get just right. An automatic updater also had to be added to the system in order to facilitate its deployment.

In the case of Galaxy Pirates this game was developed as a 3D game. The game was developed using 3D Studio Max and Director. There were many adjustments needed to be performed on a 3D mesh before it could be converted from 3D Studio Max and put into Director. This involved resizing the model in 3D Studio and flipping the model 90 degrees. Another challenge in getting the content from 3D Studio Max into Director was in getting the textures to

transfer over correctly. Some of the textures with transparencies were not transferring correctly and needed to be remedied or altered in a different method than what is usually done. It then became a task to balance media and playability issues for the lower end systems, without compromising the quality and detail for the higher end systems.

Numerical instability was another challenge that was difficult to deal with in simulations. When you are creating a simulation you have a trade off between speed of the simulation and the accuracy of the simulation. For example, when simulating part of a projectile you apply the velocity of the projectile over a time step of the simulation. This will tell you how far the projectile moved during the time step. Now, if you are using a large time step the path of the projectile will look chunky, but the simulation will run rather fast. If you were to use a smaller time step the path would look more realistic, but the computer might not be able to keep up with the updating. Another problem in dealing with time steps concerns collisions. If a small object is moving really fast, and collides with another object the time step could potentially move the small object so that it is partially inside the object it hits or could move the small object entirely through the other object. This of course is not a desired result in a realistic simulation.

Learning new technologies was also a challenge in the games development. The process of familiarizing the team with programs, different data representations, and varieties of media (images, models, sounds) was a difficult task to master. Things like compression, image quality, model detail, etc can all factor into the performance of a game. Again, finding a balance between low and high end representations of the media was a challenge. Also utilizing various function libraries from the programming language itself was a challenge in that they behaved in ways you never expected, or you hadn't good documentation so that it became quite difficult to determine how the functions actually worked and what they were doing.

Artistically, there were many challenges in initial phases of the games' development. When the designers arrived, each programmer had a completely different style in mind for each of their games. A big challenge was for the designers to make the games look fantastic with the short amount of time they had to

accomplish this. Some issues included developing 3D style art, which was in actuality going to be 2D, for both Kaizo and Mirror X. Galaxy Pirates was also difficult to work with artistically because of the limits on the detail in the 3D art as it was going to be delivered on the web. Overall developing art for all the games was a huge challenge since the designers arrived after the initial conception of the ideas and were forced to work with narratives and pre-existent designs the programmers had already conceived. When the process of programming and coding had started, the narratives were still at a very basic stage of storyboard development. The scripts the programmers were following served just as a point of departure for developing the storyboards and further steps were necessary to develop in order to create a narrative and a map of actions that the players could follow and to increase their level of involvement. It was still necessary to define the world of the games, their characteristics, and the characters' respective definitions. It was also necessary to delineate the nature and role of the enemies as well as the goals for the players in relation to the stories. The most difficulty was in linking the physics content with the stories themselves. It was necessary to add a narrative/ conceptual designer into the group to be able to piece together the game stories as well as to assist in developing the concept art for each game in terms of graphic interfaces as well as engaging narratives.

Finally, we need to mention that there was a big challenge we encountered that still has to be addressed. The target schools we were developing content for in Northern Alberta have 900 computers and their current hardware is running under the minimum specifications required to run the games properly. David Hauschildt, IT Manager at the School Division in Fort Vermilion, said that the dream of developing high-end 3D games was wonderful, but by the time all the schools will have the technology needed for viewing these games, the games will be out of date. He also said that the schools cannot upgrade one or two computers; It means that they would need to upgrade the 900 computers they are in charge of.

What we found at the schools were computers with the following specifications:

Pentium III - 450/500 MHz

ATI Rage 3D Pro Video card - 4 Megs RAM - (No transparency)



DirectX 8.1
Drivers (Unknown) no access.
Flash 7, Shockwave 8.5, Java 1.2

However, the following would be the minimum specifications for the computers in order to run the games properly:

CPU: Intel Celeron 2.4 Mhz / Athlon 1800+
Memory: 256 Meg RAM
Video Card: 32 Meg video cards with 3D Acceleration (NVIDIA / ATI / Intel)
Java 1.41, Flash 7, Shockwave 8.5,
This is of course a minimum system specification. If somehow better computers could be obtained, they should be.

David Hauschildt said that there isn't any money to change the 900 computers, to add more memory or to replace the video cards and he didn't consider it to be a good idea to change just one computer in each school since this is not the policy of Alberta Learning.

Due to this fact Galaxy Pirates will definitely not run in its current form, and we believe this game should be modified in one of the following ways:

1. Removing the Havok physics engine, and scaling the models and graphics down tremendously. This would involve new lower polygon and image art, and creating a new simplified physics and collision engine. However this solution would greatly compromise the quality of the game.
2. Creating a 2D isometric version of the game, faking the 3D, using only 2 dimensional images. Doing this solution would involve creating new graphics and linking them into the game. Modifications to the current physics engine would be minor and a lot of the current code could be reused for calculating the trajectories and angles. Also most of the game play code would be reusable as well.
3. Creating a 2D version, of the game as a side scrolling adventure type of game. Similar to option 2, this solution would involve a new set of graphics to be created, but the modifications to the engine would be minor. Again, most of the game play code would be reusable.

4. Creating a solution similar to options 2 or 3, but also replacing the Havok physics engine, creating a new physics engine, and a collision engine.

While all are potential solutions, options 2, 3 or 4 are probably the best practical solutions for dealing with the systems that are currently in place at the schools.

However, these modifications could not happen during this time since that would imply an extended time of at least 3 months.

1.2.7 DESIGN:

Q4: Identify the approach taken to develop physics games for RACOL teachers.

The design for this portion of the content involved close consultation with the curriculum designers and physics teachers engaged through the University of Alberta. The Banff New Media Institute designers also worked closely from the Alberta Physics and Math Curriculum books, used their home University Professors as Mentors and relied a lot on their group knowledge and dynamic to develop the games. Working closely with Edmonton, the team tried to achieve clarity of course curriculum applicable to the games. The games built off of the early design retreats. The team required ideas in instructional design (which questions to ask that would be useful for the teachers) in addition to the physics knowledge.

The team also worked closely with Sara Diamond, Director of Research at The Banff Centre to ensure attention was paid to the authenticity of the use of the new media form in this context. This portion of the RACOL project was located at the Banff New Media Institute specifically because of our deep expertise in designing delivery systems and cross platform content for new media. We paid special attention to engaging high level aesthetics and design choices with these games that touched upon the innate potential of web based new media games while at the same time ensuring they were academically sound and inline with the Alberta curriculum.



1.2.8 OUTCOMES:

Q5: How did you achieve the deliverables? If you have the milestones and task lists that have been mapped out over the course of the games development you can plug them in here.

As mentioned above we achieved the deliverables through a series of milestones and task lists, which were controlled and accomplished through the use of established schedules. Please find the attached milestones and schedules for your review:

1.2.9 ACHIEVEMENTS/CHALLENGES:

While the games are still in prototype phase, three of the four are close to completion, needing only two or three months to be viable!

The core achievement is the incorporation of true game play, playability in the actual design, narrative and science knowledge. What is more, each game engages with a different kind of gaming strategy, from RPG, to adventure game to a gentle shooter. As one of the young team members stated, "We will have three solid diverse games that cover various elements of the curriculum—these are aesthetically diverse and represent a rich array of games genres. "

In **Mirror-X** the player takes on the role of Maya, a school girl and electronics inventor who is trying to save her community from mass redevelopment. With only her custom built laser watch and stealth tactics she uses the principles of reflection, refraction, laser points, and diffusion to defeat her enemies.

Galaxy Pirates follows the adventure of an unlikely duo as they battle across a fairytale like landscape. They are defending their planet against the clones of a cosmic invader. The game explores kinematics, their energy and potential energy, dynamics, accelerations, velocity, distances and vectors.

Infinite Prime allows players to experience life in space, as a space courier in the year 2034. The player begins learning the basics of space flight and related physics to acquire their flying license. The

game uses the solar system to illustrate concepts such as the gravitational constant and introductory graphing. The Questions & Answer section of this game deals with a broad range of physics content. Currently, it focuses on an introduction to unit conversion and kinematics. Students are rewarded for correct responses with upgrades to their ship, and clues to uncover a government space conspiracy.

1.2.9.1 Lessons Learned

There are many, many strengths to this project. As Craig Montgomerie, PI stated in a recent interview, "you have to be flexible. Nothing works in the way it's supposed to when you implement these technologies."

This statement was reinforced time and again. The RACOL project is a success story. All participants in the process at Banff see themselves as having learned a tremendous amount, whether new programming languages, the implementation of design into programming, their art direction and design skills, their ability to cope with cultural diversity, their interest in new forms of gaming, their sense of satisfaction at having built new experiences, their sense of being on the brink of a new phenomenon: truly playable educational games, their sense of visibility in their careers, their interest in Aboriginal and Northern communities. When asked what they learned, the list goes on and on. What is more, the young team members have completely constructive suggestions about the experience and how to make it more viable in future instances. What is more, the Edmonton team was able to adjust the project to fit the initiatives at Banff.

1.2.9.2 The Development Process

Each programmer acted as a developer, working on his or her own game from beginning to end. The writer/designer and designer suggested shifts in the narrative structures and contributed graphics, but the fundamental concepts came from the programming team who had begun the design process. This meant that there was true commitment on their part to their own game. It also meant that they were at times intransigent in accepted suggestions for change, although this eventually resolved itself. It meant that there was little interdependency between each

developer/programmer. They did not test each others' games, share code or really support each other, except as a team who were working to deadline on the project. These roles fell to the designer, the writer/designer, who acted as a liaison within the team, the manager (Diana) and line producer.

As well, each game was coded in a different programming language. This was permitted at start up for several reasons. Each game required different kinds of interactivity, and graphics, which tended to suggest different programming languages, JAVA, Director, Flash. As it was a research experiment, it seemed valuable to also test the kinds of software environments that most enabled educational game design. The experience provides a rich test bed for analysis. The down side of this approach is that the programmers were on their own trying to solve coding problems. A team approach could have created efficiencies in technical problem solving.

The fact that each developer/programmer had their own game to work on meant that there was not a team based project design and programming approach to a set of collectively brainstormed games or games that were externally provided. It meant that a more lateral, democratic development approach was needed. This created a positive culture within the team, but it meant that there were challenges in final decision making, especially on the creative front, around what would be integrated and what excluded. Two developer/ programmers saw themselves as artists as well as programmers. They were the least comfortable with designer input into their games, although one eventually did accept it. The programmer who was most open to aesthetic input has the most graphically seductive game, which seems to appeal across a larger community of students.

1.2.9.3 Leadership Expectations

A leader was hired for the game development side. The expectation was that this person would coordinate design and programming, share knowledge amongst members, moves the project forward and develops documentation. These expectations were not ones that he felt comfortable fulfilling, in part because it was a peer group, all with their own games.

In fact, various team members stepped into leadership as needed. This mostly worked, but meant those key elements, like documentation and key knowledge sharing lacked stability. This improved over the course of the project. Healthy collaborative teams can shift leadership as needed on a task basis. A lesson of this project may have been that the structure and inherited culture (university classes) made “leadership” difficult and an external coordinator was required. Diana Pabon-Agudelo took up this role, working with line producer Zoë Curnoe.

1.2.9.4 Documentation

The games are now being documented, with design documents for each and technical specifications for each game. The Banff PI on the project and the Banff team did press for documents to be developed. These were completed after development started, not before. In future projects, we will work from design documents from the start up of the project as we do at Banff with other new media projects.

This somewhat reversed process is in part because the programmer/developers came in with games in mind that they had been working on. The advent of the two designers who came from a formal games design background immediately assisted this process.

1.2.9.5 Feedback Processes

Working with a young team requires constant dialogue and support. Diana Pabon-Agudelo, the project manager on the Banff side provided this consistently.

The video conferencing process was valuable in providing regular benchmarks for the team in Banff, the sense of being part of a larger project and in making visible the rather invisible member of the Edmonton team. Cathy King was a consistent organized presence and helped to determine deliverables, pacing and the negotiation of what it was possible for the team in Banff to achieve.

However, the video conferencing also had frustrating elements to it. The lack of bandwidth at Banff meant that the possibilities of being online when Craig, Connie, Cathy or David tested the games, talking them through the games and developing a deep feedback context were impossible. This contradicts workshops that the NRC and National Arts Council has held with Pinkus Zuckerman where high

speed networks allow participants to share complex techniques and feel like they are in the same room. Video conferencing in the RACOL instance led to feelings of frustration in terms of co development. Presentations were often inaudible and hard to see. It was impossible to connect with Fort Vermilion and to have ongoing input from teachers and students. This was frustrating to all in the Banff game development team.

Also, the youthful design team was used either to game industry tough criticism or university style critique. They yearned for more criticism from the Edmonton team and worried that the team there had not really tested the games. The fact that the games required physics knowledge was also a problem in terms of getting team feedback-if you could not hack those equations you could not progress in the games.

In short, a project of this nature requires rigorous feedback and dialogue from research participants. The feedback from Edmonton needed to be less supportive and based on actual curriculum needs and game critique. Banff feedback was tougher and they used it to shift navigation, quality of information to players, etc. There may have been confusion between providing ego support (much needed) and a process of really critiquing the games. Much of the critique was on the art work, text fonts etc., which were elements that were in placeholder form, the designers/developers all wanted more input on games content, and play design. In the recommendations, there are suggestions of how a team should look in the future and what the feedback mechanisms should be.

The problem of feedback was amplified when some members of the team went to Fort Vermilion. The science teacher there was skeptical as to the value of games, could not work with one of the games, and was concerned about the ratio of fun and learning. These issues would have been of value as a continuous dialogue throughout development.

1.2.9.6 Team Culture

Team members have varied assessments about the degree to which their team developed a sense of identity. However, they felt that it was a relatively conflict free experience. They enjoyed the openness of The Banff Centre, the ability to work late and sleep late, the arts

culture around them that they could integrate into. They collaborated with others at Banff on other projects and matured through the process of working at Banff.

They bonded through playing games together, exploring music and talk.

1.2.9.7 Gender

Gender factors in the team are important to identify. The only woman member of the actual games team was the designer. She encountered three challenges—she did not speak computer talk – instead she spoke design talk, she came from the efficient production culture of computer games design into a youthful and somewhat haphazard team, and she was the only woman, and one committed to a different kind of representation of female game characters. We hired her from commercial games industry because of this. It was necessary to shift the mostly masculine culture of the programmers. Connie H. provided valuable materials on gender and games and cultural difference. There was not a mechanism to provide ongoing dialogue about these materials, although there was discussion about each game and gender issues. However, there was not consistent follow-up or integration of the theory into the design process. This said, the combined efforts of the female designer, the female team management, the wish on the part of the developer/programmers to include female players and the efforts to disseminate other ideas about gaming did pay off. The designs are less gendered than often is that case. The culture and results were much better than most game design contexts in terms of these concerns. Certainly, much attention was paid to creating non-violent games and this is an achievement of this project.

1.2.9.8 The Teachers and the Games

There is still a tension between learning objects that have visual and interactive content and the development of truly interactive GAMES that also teach science or other subjects. The Banff project attempted to provide both curriculum and games. Teachers had mixed responses. The physics instructor in the North clearly was not interested in games but preferred limited, illustrative objects. Perhaps BOTH need to be produced, but sessions with teachers about HOW to use the games are needed in order to make them valuable. In the ABEL project (comparable CANARIE project) there

was a great deal of focus on teacher integration of new kinds of materials and their participation in the design process. Not surprisingly, this group of teachers has a larger comfort zone with the adoption of new kinds of TEACHING materials. RACOL was successful in many ways—its next phase requires teacher liaison with developers at a higher level.

As well, in the face-to-face test with Canmore and Banff students and teachers, the teachers and principle provided strong encouragement for the holistic approach. The Banff high school principle was so enthused that he volunteered ongoing involvement in user testing and feedback, as did his teachers.

1.2.9.9 Liaison

A key weakness was liaison between Banff, Edmonton and Fort Vermilion School District. In general, while we had a system of communication with the Edmonton team, we had a gap in communication between The Banff Centre and the user community in the North. This is the most significant weakness of this project. There was a gap between the materials that we were developing and the teachers who were on the ground in the North, whether they were teaching Science or Aboriginal Studies. Banff content developers did not understand the community they were developing for, although trips to the North were helpful. This understanding required ongoing liaison.

This was particularly painful because in planning the project, at the second Banff retreat, before start up, we had underscored time and again, that we would only truly be effective if an ongoing link was created between The Banff Centre and teacher developers. We needed their input into instructional design in science. We needed them to know what we were creating and have ongoing feedback. We needed their students to test games. We needed Aboriginal input and feedback into the learning content.

At the Banff retreat, we discussed creating teacher/student co development committees to work with Banff. We discussed one of the Grade Twelve students coming to Banff to work on the science games over the summer, bringing user-testing capacities to Banff. Banff did work with a local high school student on the science video interviews; this approach is a good one and can be continued.

This perception that a strong liaison was needed was reinforced time and again in interviews with the development teams for Aboriginal curriculum and for the games, who yearned for direct teacher input along the way.

The liaison was also necessary to better understand and define the development platforms for the games. The team at Banff designed to SuperNet specs and the information in the planning documents for RACOL. It would have been of great value earlier on in the project, for the developers to learn about the actual context of Fort Vermilion. This could have allowed development from 3D into 2D as part of the plan. The games will be viable through SuperNet in many communities; however, not all can be played in the Fort Vermilion School District where they were aimed as well as Alberta (Science Toys goals).

1.2.9.10 Technology Platforms

This is already discussed in the technology report. However, the gaps between what is stated in SuperNet in standards, what the school district originally scoped out as the delivery capability and the development platforms widened over the project. This became a problem, and led to one of the games being unplayable in the North, perhaps more because of school security regulations than standards. This is very frustrating for the design team, and represents a gap in planning and communication that should have been bridged. As well, there was an eleventh hour attempt to switch the 3D game into 2D that was suggested at one point that was technically impossible.

Several things could have helped here. When the team went North, they needed more access to computers to actually test their games. They were denied access by an IT administrator at the school. Early on assessment of the development platforms by Fort Vermilion and Edmonton might have allowed us to switch directions earlier.

1.2.9.11 User Testing

User and usability testing are the benchmark of a successful development process, yet these came late in the game for the RACOL group. When set up, user testing included students in the North and communities from around the Banff area and Morley. The insights that students and teachers brought to the games were deep

and resulted in immediate response from the team at Banff in making certain that their games worked technically (usability) and made sense and were fun to the students (user testing).

Designing user testing throughout the project would have strengthened it. A problem for local testing with artists and others at Banff was the need to understand Grade Twelve Physics. Still, a testing system could have emerged here. As well, the development team needed to test each other's games. Luke I. is the only person on the team who has fully played all the games. This is typical of the games industry, but needs to be addressed by including test groups.

More testing was needed.

Q6: Could you describe any technological innovation within the context of education or training?

The concept of making learning enjoyable has been around for quite some time. Unfortunately the reality of it is quite different. Mixing gaming with learning created a very difficult hurdle to jump. How much information needs to be presented? Should the game act as a teacher or only enforce content previously learned? Should the game be mostly a teacher tool or focus more on gameplay and player involvement? We think the games themselves are innovations in the context of education and training and as in games also. Most of the technology and content currently in the education and/or training market is currently focused on tutorials, or flat image based content. So developing games for educational or training content is innovative in itself. Currently, many students are immersed deeply in media, videogames, and entertainment and may find it a challenge to learn from old media (books, teaching methods). Educational videogames propose a refreshing and effective means of teaching concepts and stimulating the student to learn in a fun way. These games were conceived to bridge the engagement gap between education and mainstream media and electronic entertainment. Although the games all cover physics the means by which topics are presented vary widely from game to game. If the games were to be in multiplayer mode, (which the SuperNet will make possible) they would be unique and communal in allowing students from various and remote locations to meet and collaborate in a real time environment.

Q7: Did you use broadband technology

Broadband technology aided in the transfer of the game over the Internet. To really use the power of broadband the games would need to involve a multiplayer aspect since downloading them is only a one-time deal. Once you have the games, a .swf file will run as a standalone application. With regards to the question, we would need to say that broadband technology didn't really play a huge role in distributing the games (in their present stage of development) through the Internet. However making the games multiplayer would definitely use broadband to its potential. Having Broadband capabilities would allow us to create rich and detailed content since there would be enough speed to handle downloading this kind of data.

Q8: Were there any technological barriers to producing these games for RACOL?

During the production of the games group meetings via video conferencing were held to review milestones and the current status of development. The throughput available to the The Banff Centre sometimes couldn't handle the load of the meetings along with the regular daily traffic at the Centre and we had to resort to teleconferencing. On the other hand the systems and tools provided were more than adequate to complete the task of games development.

1.2.10 LESSONS LEARNED

Q9: What recommendations would you have for improvement?

Develop a Coherent Linking Metaphor for the Games

While the games needed to work as stand alones, it would also have amortised their value to build them as a series with a linking metaphor. This was not possible in the time frame and the way the games were developed.



Develop on the Same Software Platform

This will help with code sharing, tasking, efficiency of game creation and navigability of final games.

1.2.10.1 Liaison

We need to have appointed science content and interactive design liaisons that are paid to participate in the development team, either through video conferencing or in situ. We need an Aboriginal content advisor from the community with the conditions noted above as well. A games advocate was needed from the curriculum/teaching development group in RACOL. The two points that follow build on this:

1.2.10.2 Achieve Clarity on the Relationship between Curriculum Objects and games that stand on their own with Curriculum

The games have the potential to be used in both of these ways. Planning a double use from the beginning would be efficient and wise. The games are fun learning experiences that can excite students about physics. They can be tweaked to work with more popular knowledge and can also be structured in levels to allow students to work with them as curriculum objects. Clarity is necessary from teachers and the design team as to the goal of each game or each VERSION of the games. RACOL designers thought they were making full games. Clearly some of the teacher feedback from the North suggested that one teacher at least would have preferred learning objects.

1.2.10.3 Achieve Clarity on Gender Issues

As well, a seminar on science, gender and games would be useful in the future to incorporate the learning about this issue into the consciousness of teachers, as well as designers. Again, one teacher was skeptical about including narratives into games and fully developed characters. Yet, much research shows that these strategies engage young women and girls in game play.

1.2.10.4 Face to Face and Video Conferencing

All the team members interviewed felt that more face time was needed and that video conferencing could be used in specific ways:



1. Team should visit Fort Vermilion (or the next partner community) at the beginning as a whole to understand the culture. Putting money into this exposure saves money in addressing incompatible design.
2. Liaison with community in North needs to be ongoing.
3. If broadband had permitted video link, testing of games, teacher involvement would have been optimal (possible now at Banff because of the high-speed connection).
4. Regular face to face was needed—Edmonton team needed to come to Banff and play games earlier, spend time with team. Fort teachers needed to come down more and use Banff context. Liaison with the principal, Beverly was fruitful and helped development team to understand her context (Beauty of Collaboration).
5. Video conferencing needed to have more show and tell involved. Needed to have discussion of the materials that were recommended by experts from Edmonton by the team.
6. Video conferencing technology was useful in making people feel more familiar to each other. It was frustrating because of delays and communication lags.
7. Useful for deliverables check in.
8. Recommend that use sparingly and in highly designed ways, i.e. for structured discussion and presentation.

1.2.10.5 Other Tools

The team found messenger extremely helpful as a development tool, helping them to feel connected and keeping a sense of identity in place. It was suggested that it would have been good to have a content expert on messenger as well. They would have liked to use Creative Tracker to track project development and discuss issues; this has been very helpful for HorizonZero. They are SHY is talking openly about criticism and used ONLINE TOOLS and CHAT to do this. CreativeTracker is also excellent for this purpose as well as bug tracking and project management.

1.2.10.6 Team

The team would have been more coherent if it assembled at once, with designers and programmer/developers there from the start. There needed to be more designers, so that each game could have

a dedicated designer. There needed to be a teacher or content expert, and instructional designer who were part of the team.

It would have been of value to have a project lead that understood both design and programming and could facilitate, with this kind of technical knowledge, ongoing dialogue within the team, co-development of assets, co-testing. It is important to emphasize however, that the CREATIVITY and ENTHUSIASM of the developer/programmers was enhanced through their retaining creative control of their projects. They have learned a great deal through this project, as have the designers. Everyone stretched their capacity to the limits and came out with important learning.

An alternate approach in the future will be to assemble the team, hold brainstorming sessions, extract the key games ideas, and then build the project from that point out, with a team leader who can manage a division of labor.

Team building exercises as well as organized social events would have helped working process from the beginning and broken down the isolation that some team members felt.

1.2.10.7 Training

In the future, as with projects in the rest of BNMI (co productions, Horizonzero.ca, CEE projects) Banff Centre procedures for design and implementation of new media projects will be brought into game design. It would also have been valuable to call on the ongoing expertise of Dr. Parker at U. of Calgary in developing the working methods of the team and have some workshops in new media and games design at the outset of the project, rather than assuming that their university training provided them with these skills. All said, the learning on the project is terrific and positive, with all young participants seeing this as a leap forward in their careers.

1.2.10.8 User Testing

User testing needs to start at the Alpha stage and move through the entire process, including the design team, local community members at Banff, teachers and students. As well a computer that

was at the technical spec of those in the North on site at Banff would have helped to build to capacity for the client.

1.2.10.9 Documents

In the future, design documents and technical specs need to be developed, signed off on and then acted on, not retrofitted to projects already underway.

INFORMATION DISSEMINATION

Q10: List the workshops, presentations and description by which you had a chance to share RACOL developments with a wider audience (Bow Valley, Quintessence, Beauty of Collaboration, etc)

The Banff Centre disseminated the RACOL project in the following ways:

Science Toys Web Site

This site holds the assets from the RACOL project as well as video assets from Science Toys. It is available through the web for learners and teachers. A major press campaign will accompany the completion of the project in 2005.

Banff Television Festival

PI Diamond featured the RACOL project on a panel on New Media and Education at the 2003 Banff Television Festival. David Geelan presented the RACOL project.

Quintessence, 2002

RACOL instructional designers and physicists participated in the Quintessence summit at Banff, gathering information on scientific visualization and sharing their research initiatives.

The Beauty of Collaboration, 2003

RACOL researchers provided an overview of the project and its achievements with participants in this summit, who work in collaborative systems and content.

ABEL

RACOL games designers shared their projects with ABEL (also CANARIE funded) researchers and teachers at the ABEL Summer Institute in 2003.

Bow Valley and Morley

The Banff Centre held many open houses, which featured the RACOL project over the course of the project.

In particular it had a usability-testing day, which brought in students, teachers and principal from the Banff and Canmore High Schools. This both publicized the project to teachers in another school district and provided excellent user testing for students. The same was done for students from the Morley Reserve high school.

February 27, 2004. 11:30 a.m. – 1:30 p.m. OPEN HOUSE: Racol Games Presentation. Canmore Collegiate and Banff Community High School. 60 students from grades Grade 11 and 12 tested the games and provided us with their valuable feedback.



March 17, 2004. 2:00 – 4:00 p.m. 8 Aboriginal students from Morely Community High School from grades Grade 9 to 12 visited The Banff Centre, tested the games and provide us with their valuable feedback.



The Morley students played the games after the first testing by local high school students and the changes suggested by these students had been completed. We were able to see the improvements made in the games and how this added to the enjoyment and understanding of the Morely students. They were engaged by the games and provided very positive feedback on game play, content and the game concepts.

1.2.10.10 Other Visits and Workshops

October 2, 2003; 12:00 p.m. – 1:30 p.m; VISIT FROM CELIA PEARCE ; The Banff Centre. 2:00 pm. – 5:00 pm. RACOL/U of A Team: Cathy King, Project Manager of RACOL, David Geelan, Physics Researcher and Connie Hilditch. Banff Centre team: Diana Pabon-Agudelo, Production Coordinator, BNMI; Games' Developers: Anita Johnston; Jared Hopf; Luke Ilett; David Kretz, Deifante Walters.

Celia Pearce is an interactive multimedia designer, artist, researcher, teacher and author of *The Interactive Book: A Guide to the Interactive Revolution* (Macmillan), as well as several other papers and articles on interactive media culture and game design. She currently holds a joint position as Research and External Relations Manager, New Media Arts and Associate Director of the Game Culture & Technology Lab of the California Institute for Telecommunications and Information Technology—Cal-(IT)²—at UC Irvine, where she has also taught game design and interactive art. Previously, she was a Visiting Scholar at the University of Southern California, where she did games research and helped to develop an MFA Program in Interactive Media for the School of Cinema-Television. Ms. Pearce's 20-year career as interactive media designer includes: Iwerks and Evans & Sutherland's award-winning *Virtual Adventures: The Loch Ness*

Expedition, a 24-player virtual reality attraction, the lounge@siggraph and The VR Gallery, SIGGRAPH '95, and Purple Moon Friendship Adventure Cards for Girls. Her art projects include: *Body of Light*, an interactive multimedia performance piece done in collaboration with guitarist Bob Rice, which has performed at L.A.'s Electronic Cafe International and Canada's Banff Centre; *Public Emergence: Procedural Painting #2*, a participatory painting/installation on the front of her Venice, California loft.

1.2.10.11 Feedback:

- a. There were questions about the intended audience and the games' testing process.
- b. Possible methods for early "play testing":
 - i. Power Point. Mock-up Graphics for play testing the interfaces in terms of functionality and appearance.
 - ii. A survey sheet and the questions that would be of use in the designing process:
 - Do you like this? In reference to the colors/interface/characters;
 - Name of your favorite-games; hours played?
 - What kind of games do you play? Console vs. Computer; Which Console?
- c. Play testing issue: November is the planned time for play testing with teachers and hopefully with some students.
- d. It was suggested that reading books such as *Snow Crash* and playing games such as "putt putt" and "Zelda: Majora's Mask" would be beneficial.

November 20, 2003; 2:00 pm. – 5:00 pm. First public presentation. The Banff Centre. Audience: 30 People from:

- The Creative Electronic Environment (CEE) ; The Banff Centre
- Media and Visual Arts Department (MVA); The Banff Centre
- Aboriginal artists participating in a Thematic Residency Program called Communion and other Conversations; The Banff Centre.

In general the audience liked the presentation. The following were the general comments for each game:

Notes for “The Infinite Prime” (David Kretz):

How are you going to get a child to do the Q & A?

Answer: One would get items necessary for continuing in the games.

Sara mentioned she’d like to see the story motivating each task.

From the audience It was suggested that each space station give out a passport for answering the graphing and Q&A at each station. This passport would allow the user to go to different space stations.

It could be a possibility to involve Trent for designing new space stations.

For this game there was a lot of emphasis on making the missions have a global narrative push.

Another important suggestion was to make the editor more user-friendly. Not so much information at once. Something like a “Mission Wizard”. Mission suggestion, from Carmen, garbage collection.

Notes for Kaizo’s Adventure through time and space (Eric Yeung)

How are you going to link the time machine narrative to the physics content? Is it possible to link the content of the Cathode Ray tube with another physics content more related to the concept of time? How?

Notes for Pirates and Cannons (Jared Hopf)



Perhaps this game doesn't need an explicit story, could be an experiment type game: For example, you have chemicals A and B and when you put them together you discover that something happened and you make a report.

If the game maintains the idea of collecting items, it would be good to see a motivation for the item collection.

Notes for Light Physics (Deifante Walters)

Story line is still controversial.

An issue arises about what is being watched. Suggestions are social issues, such as parents treating their kids properly, or something related with social behavior. Perhaps what is being watched can be a little more 'light', such as surveillance of animals that are dangerous for the community.

Graphic style gives some feeling of Berlin. The fences are also a bit aggressive.

1.2.10.12 Notes for Luke Ilett and Anita Johnston

Need a unifying idea for all the games. It would be very useful to have more description on the narratives and the global game world.

November 25, 26, 27, 28, 2003; VISIT TO HIGH LEVEL; FORT PUBLIC, LA CRETE AND FORT VERMILION SCHOOLS DIVISION. One of the programmers, David Kretz, visited the schools and presented all the games to the Science Classes at the schools. Please see below an example of the feedback received:

Mirror-X:

Prism

Speed – TURN IT UP

Hard to see what is going on all the time (setting up mirrors, miss)

More info required to complete the job

Maybe follow the laser when you shoot it

Polarization (shut light off)

Measure distances

Found it hard to use the A button and didn't know to change properties

Liked the main character and the design of the level

At this point in time they couldn't solve the puzzle presented

Need some kind of in game help



Kaizo

No death in the story

New characters of course

Good design – putting things together works with NOM concept

Needs more story to hold the game play together.

Couldn't find the link to the other part of the map

Once showed the items they put them together easily enough

Found and used the console in the game with no problems

Cannons

More physics related game play

Shooting is ok says the TA

Liked the 3D touch

Fun game play and the theme

More explaining about the display and their meaning to them

At one point they couldn't see the enemy cannon

Infinite Prime

Still hard to fly and land on the stations

Liked the 3D cut scenes

Change the go buttons placement

Would like to see a html based walkthrough

Some key concepts for mini-games

- Pulleys
- Force, work, power
- Component Form (Vectors)
- Centripetal Force

Found it hard to land on the stations (slowing down)

Found the help easy enough

Got the hand of zooming quickly

Completed each type of job without any help

Said they would have liked a walkthrough first

December 5, 2003. WORKSHOP: INSTRUCTIONAL TECHNOLOGY. Led by Connie Hilditch. Fostered by The Banff Centre. The following were the conclusions from Connie's visit:

Infinite Prime:

1. Interface Improvements



- Grammar and spelling of all text needs to be fixed
- Font size and type needs to be fixed for better visibility

2. Narrative Review (Luke and Dave)

- A review of the game narrative needs to be completed-a write up of your plans and next steps related to the narrative should be sent to group for review.

3. Conceptual Mapping of game

- Clearly tie how the actions and features of the game relate to the physics concepts within the game, in a way that any level of user can easily tie the game actions/features to the effects of physics (make sure that clearly this game shows how all pieces of the big picture concept fit together, not only via the functionality of the game but how that fits into physics).
- For example it is important to clearly explain the effects of gravitational pull on the spaceship even when the player is not engaged in any movement

Mirror X:

1. Game functionality

- The java code errors need to be fixed in this game. It may be necessary to decide on one version of java and stick with it or that may have to transfer the game's code into another format. Users must be able to easily access this game and currently there is quite a lengthy process to even be able to open it. The task is to solve this issue as well as the java code errors and make the game more user friendly in the technical sense.

2. Graphics



- Continue working on the game's graphics.

3. Conceptual mapping of game

- Clearly tie how the actions and features of Mirror X relate to the physics concepts and features present in the game.
- Be sure that these physics concepts can be easily tied to the game features.

Galaxy Pirates:

1. Conceptual mapping of game (Need to have a first draft done with completion of mapping.

- Clearly tie how the actions and features of the game relate to the physics concepts and features you have in the game.
- Be sure that the physics concepts can be easily tied to game features.

2. Graphics

- Continue working on the game's graphics.

December 12, 2003. 9:00 a.m. – 12:00 p.m. VISIT FROM LOUI GHIZ, Investment Analyst from TELEFILM; Presentation of the games. Banff Centre team: Luke Azevedo, Director of Operations and Technology, MVA/CEE; Diana Pabon-Agudelo, Production Coordinator, BNMI; Games' Developers: Anita Johnston; Jared Hopf; Luke Ilett; David Kretz, Deifante Walters.

January 26 and 27, 2004. VISIT TO HIGH LEVEL; RAINBOW LAKE AND FORT VERMILION SCHOOLS DIVISION. Netera team: Cathy King and Connie Hilditch; Banff Centre team: Jared Hopf and Diana Pabon-Agudelo. The games were presented to a physics teacher, Keith Martin and to David Hauschildt, IT Manager, School in Fort Vermilion.



MEETING WITH KEITH MARTIN, PHYSICS TEACHER - SCHOOL IN RAINBOW LAKE, January 26, 2004, from 4:00 pm to 7:30 pm. This meeting was attended by: Jared Hopf, Diana Pabon-Agudelo, and Connie Hilditch.

Keith found Cannons to be a very useful tool because the kids could calculate the equations require to aim the cannons. Mirror-X would be useful because it also deals with solving equations.

Infinite Prime, Keith said, was not very useful for his class. He said that when students are traveling in space they are not solving or formulating any equations to go from one station to another. He said that in this game, the students will 'play' more than actually learning/reinforcing physics concepts. So, in its current form, it was hard for him to say how much he would use this game in the classroom.

He liked the idea of stimulating students by means of games, but he wasn't clear how he would use all of the games in the classroom. He felt Cannons could be used very easily, because of its equation solving aspect.

His suggestions for games use in the classroom were: Single objectives + some clear actions.

He did not feel it was necessary for the games to have very involved storylines. He felt it was only necessary to capture the attention of the students, but to be sure they learn TO FORMULATE PROBLEMS and to think about how physics actually works while playing the games.

Keith also commented that the biggest problem he faces as a physics teacher is that the students don't want to learn physics. They are generally not interested, and he believes this is because they don't know how to problem solve.

1.2.11 Action

- It would be helpful to complement the games with methodological teaching suggestions for the teachers on how to incorporate the games into their classrooms.



MEETING WITH DAVID HAUSCHILDT, IT MANAGER, SCHOOL IN FORT VERMILION, January 27, 2004, from 2:00 pm to 4:00 pm.

This meeting was attended by: Cathy King, Jared Hopf, Diana Pabon-Agudelo, and David Hauschildt.

February 6, 2004. 2:15 a.m. – 4:15 p.m. MEETING WITH MICHAEL HOCH, art/scientist, e-Platform Technology Center, Broadband Services Company, Sony Corporation of America. Mr. Hoch tested the games and provided us with a valuable feedback in terms of graphical interface design.

March 3, 2004. 9:30 – 10:30 a.m. Edmonton. LEARNING SUITES LAUNCH. Deputy Prime Minister Anne McLellan and Alberta Premier Ralph Klein helped launch the learning suites in an event linking Edmonton with the northern Alberta communities of La Crete, Fort Vermilion and Rainbow Lake. During the event, participants shared their excitement about the project, reinforced their dedication to learning, and demonstrated how the games work. The Banff Centre Team: Luke Azevedo, Director of Operations and Technology, MVA/CEE; Susan Kennard, Executive Producer, BNMI; Diana Pabon-Agudelo, Production Coordinator, BNMI; Games' Developers: Anita Johnston; Jared Hopf; Luke Ilett; David Kretz, Deifante Walters.

March 30, 2004. 3:30 – 4:30 p.m. Banff. Official Presentation of the games/Final Milestones to the RACOL/ University of Alberta Team: Craig Montgomery, Principal Investigator of RACOL, and Cathy King, Project Manager of RACOL; Banff Centre team: Luke Azevedo, Director of Operations and Technology, MVA/CEE; Susan Kennard, Executive Producer, BNMI; Diana Pabon-Agudelo, Production Coordinator, BNMI; Games' Developers: Anita Johnston; Jared Hopf; Luke Ilett; David Kretz, Deifante Walters.

Infinite Prime (David Kretz)

- Reviewed game text and edited/corrected where necessary.
- Changed Q&A section as per student testing input.
- Space stations now have characters attached to them.
- Station now has arrow indicators to make it easier to locate.
- Added passport feature.
- Added new menu system.
- Added new content from physics texts.



- Pool simulation completed cause and effect objective based on momentum physics principal and impulse.
- Added life and shields to the ship.
- Added items as rewards for ship upgrades.
- Added comics as awards.
- Added comic cut scenes.
- Completed play testing and adjusted gameplay to insure story and game match.
- Graphing engine changed and is now more “gamelike”, more interesting gameplay.

Galaxy Pirates (Jared Hopf)

- Added new interface.
- Font fixed for in game text
- Event engine implemented.
- Fade ins and fade outs for comic book cut scenes completed.
- All physics content in game.
- New world art inserted in game.
- Added new features to HUD
- Car still has issues but is drivable in gameplay.

Mirror X (Deifante Walters)

- Third level completed (Game play, timing, player actions, animation, break dancers)
- Changed interface according to high school testing feedback.
- Physics content fully functioning.
- Action sounds inserted in game and intro page music loop.
- Sound loop for completing ghetto blaster objective
- Laser sounds in place
- Key clicks in place
- Added task of having to complete objective 1 to move forward in the game.
- Added police car in objective 2 to add element of time restriction.

Q12: Any publications that may have been developed.

