FINAL REPORT

MEMORIAL UNIVERSITY
Distance Education and Learning Technologies

Taking Flight: Enhancing Engineering and Science Awareness Project

INTRODUCTION

The overall goal of this project is to encourage youth to explore science and engineering concepts by using videos to pique student's interest in certain units covered in the Grade 6 Physical Science program. Specifically, this project focused on the topic *Science of Flight* in the current Grade 6 science curriculum. The rationale is to capture and highlight the topic of flight with content that is interesting and creative for Grade 6 students to relate and understand. The focus was on specific curriculum outcomes for the Flight unit and to provide directed activities to support teachers in satisfying these outcomes.

The product outcomes involved the production of two, comprehensive videos that captures the topic of flight in an effective and interactive way. The first video is an interactive video that describes flight concepts such as drag, lift, gravity and thrust, and "why airplanes fly." The second video is an instructional video of how to make and alter a model airplane for optimal flight. In addition to the video, model airplanes were provided to students to assemble in groups in a later class.

The project team consisted of representatives from Memorial University's Faculty of Engineering and Applied Science, Let's Talk Science and DELT as well as the Department of Education's Centre for Distance Learning and Innovation (CDLI). The collaboration between all partners is significant and is the reason for the successful outcome of this project.

PROJECT SUMMARY

The project team had several meetings throughout the course of the project to discuss project scope and deliverables and to map out a project plan. The workplan and milestones are provided for reference in Appendix A. Roles and responsibilities for each partner were outlined as follows:

Roles and Responsibilities

Distance Education and Learning Technologies (Production)
DELT provided the production, editing and video equipment as well as the DELT studio facility. John Bonnell, the lead producer/director, was responsible for developing the storyboard based on project resources and knowledge of task effort involved in each scripted concept or activity. Refer to Appendix B for the storyboard. He also managed all aspects of pre-production, production and post-production of the videos.

Faculty of Engineering and Applied Science (Content Expert)
Dr. Stephen Bruneau, lead from the Faculty of Engineering and a specialist in Industrial Aeronautics and Hydrodynamic, further developed the concept ideas for hands-on activities and refinement of the concept. As well, he arranged for the video footage at specific facilities in the Faculty of Engineering and Applied Science, the Marine Institute gym and the interview with Jeff Pollett at the St. John's airport hangar.

Let's Talk Science (Content Expert)
The primary role for Let's Talk Science was identifying potential schools to launch the videos and liaising and coordinating with the schools to have the contact sessions with the grade 6 school teachers and students. In addition, Let's Talk Science assisted in the development of the questionnaire tool.

Centre for Distance Learning and Innovation (Advisor)
Maurice Barry of CDLI played an advisory role in assessing whether the educational videos met the science curriculum outcomes for the topic of Flight. In addition, he arranged through the Department of Education to provide in-kind 100 model airplanes for the project.

Description of Educational Videos

Video 1 – Flight Concepts

The Flight Concepts video is a fun, educational medium that introduces and explains fundamental concepts of flight that are taught in the Grade 6 Physical Science course. It features youthful (university-aged) host/narrators with stock images and videos with voice over. It describes historic and recent references and illustrations of what flight is, and how airplanes fly. A large wind tunnel and two smaller wind tunnels were used to demonstrate wind and air concepts and graphics and images are also used to make the video engaging and interactive.

To illustrate the topic of flight, the three concepts of drag, lift and propulsion were explained and depicted as one overarching principle. These concepts are interrelated and required a detailed illustration with examples in order to understand the idea of flight.

Small wind tunnel

The video shows an interview with the Manager of the Air Services Maintenance Division for the Provincial Government, Jeff Pollett, who is a flight enthusiast and describes how airplanes fly. As well, it uses school-age demonstrations of wind forces and of flow patterns over objects.

This video is approximately eight minutes in length.

Video 2 – Model Airplane Instruction
The second video is instructional and provides step-by-step instructions on how to make and alter a model airplane for optimal flight. It is directed towards teacher and student participation in building a model airplane. The project provided model airplanes to be used by the students in class. It makes the flight concepts they learned more tangible and fun. The model airplane kits are found at: http://www.rubber-power.com/

This video is 22 minutes in length.

Hosts: Ben Colbourne and Katie Breen

Two Memorial University students, Ben Colbourne, Bachelor of Engineering program, and Katie Breen, studying towards being an educator in the math/sciences area, were the hosts of the videos.

Feedback from Students and Teachers

The lead from Let's Talk Science, Matt Pippy, confirmed two schools prior to the project completion date of March 31, 2010. Virginia Park Elementary and MacPherson Elementary agreed to have us demonstrate the two educational videos in their science classes. Feedback from each school is provided below and copies of the questionnaires are in Appendix C.

Virginia Park Elementary
On March 30, Katie and Ben met with Charlene Vincent, teacher, of Virginia Park Elementary. They showed both videos and provided the students with model airplanes to assemble in a future class. The teacher commented that "it was wonderful" and the videos were "marvelously constructed!" In the teachers feedback, she did indicate that the videos were "somewhat effective" in illustrating the concepts of flight and providing instructions on how to make a model airplane. She did indicate that she found the videos did improve the students understanding of "why airplanes fly" because of the models used and the method of explaining it. Overall, she was "somewhat satisfied" with both videos. For the Flight Concepts video, its strengths were the music and the action. For the instructional video, she thought the strengths were the step-by-step instructions provided.

The students were also asked to provide feedback on both videos. In this particular class there were 31 students who responded to the questionnaire. Of the 31 students, 21 indicated they "very much" liked the video and nine students indicated they "somewhat" liked the video on Flight Concepts. The most common response on what they learned in this video was how to make a plane, about drag and lift and how the plane turns left and right. The most favorite part of the Flight Concepts video was the interview at the airplane hangar and when Katie "flew."

For the second video which showed how to assemble a Model Airplane, most of the students, 20, liked it "very much" and 10 "somewhat" liked the video. Their favorite part of this video was when they showed the hosts flying the model airplanes and showing the step-by-step of how to build the model airplane.

The students' favorite part of the presentation was learning how to build a model airplane and watching it on the video.

MacPherson Elementary

On March 31, Katie and Ben met with Sherry Maher, teacher at MacPherson Elementary. They showed both videos and provided the students with model airplanes to assemble in a future class. The teacher really liked the videos and thought they were "very effective" in illustrating the concepts of flight and in providing instructions on how to make a model airplane. She found that the videos improved the students understanding of "why airplanes fly" because they "reinforced the outcomes taught" and "hands-on activities always increase a student's knowledge." She was "very satisfied" with the videos and thought the strengths were that they touched on a number of science outcomes from the "Flight" unit and the way the instructional video was put in sections which would help teachers and students follow along.

The students were asked to provide feedback on both videos. In this class, there were 18 students of which seven students "very much" liked the Flight Concepts video and 11 "somewhat" liked this video. The most common response on what the students liked about this video was they learned about the four forces of drag, lift, gravity and thrust. Their favorite part of this video was when the host was flying and the interview at the airport.

For the second video which showed how to assemble a model airplane, most of the students, 10, liked it "very much" and 8 "somewhat" liked the video. The one thing they learned in this video was how to make a model airplane. Their favorite part was when they showed the hosts flying the model airplanes.

Most of the students indicated that their favorite part of the presentation was the videos!

Conclusion

All the partners agree that this project was very successful in terms of the product outcomes and the collaborative nature of the departments involved. A long-term goal is to form an effective partnership between all proponents to ensure that this project is sustainable. The next step will be to discuss with the Department of Education the potential of distributing these educational videos to all schools in the province.

Appendix A

Workplan and Milestones

Work plan – February 9 – March 31, 2010
Taking Flight: Enhancing Engineering and Science Awareness

Task	**Completion Date**
1. Steve to contact interviewees for proposed video production for the week of March 8-12. 2. Steve to provide Katie with background resources to review 3. Matt to confirm school participation	February 9-19
4. Shari & Matt to design questionnaires for students and teachers	February 15-19
5. John to purchase iStock graphics, videos, photos 6. John to develop storyboards 7. Steve to develop Q & A to convey concepts in video and discuss with John	February 22-26
8. John and Steve to finalize and approve storyboard	March 1-5
9. Proposed Video production - John and Katie	March 8 – 12
10. John: post-production: Editing and graphic support	March 15 – 19
11. Matt & LTS to launch videos in participating schools 12. Shari &/or Matt & LTS to gather feedback from teachers and students through the survey tool	March 22-26
13. Shari to submit final report to INTRD	March 29 - 31

January 11 - March 31, 2010
Taking Flight: Enhancing Engineering and Science Awareness
Work Plan

		January			February				March				
Tasks	**Responsibility**	**11-15**	**18-22**	**25-29**	**01-05**	**08-12**	**15-19**	**22-26**	**01-05**	**08-12**	**15-19**	**22-26**	**29-02**
1. Develop scripts for three videos	FEAS (Lead), LTS (Lead), CDLI (Advisory)												
2. Script reviewed and approved	DELT												
3. Identify schools and confirm participation	CDLI												
3. Video production - First Video Complete	DELT												
4. First Video reviewed for feedback	All partners												
5. Video production - Second Video Complete	DELT												
6. Video production - Third Video Complete	DELT												
7. Second and Third Videos reviewed for feedback on editing	All partners												
8. Post production: Editing and Graphic Support	DELT												
9. Launch media clips in participating schools	LTS or CDLI or both												
10. Evaluation: Distribution of Survey Tool and Analysis	DELT												
11. Final Report	DELT (Lead), reviewed by partners												

Appendix B

Storyboard for Videos

Video 1 (of 2)

Grade 6 FLIGHT

Storyboard Cocept	SEB Feb 16, 2010
Chapter	Actions
GREETING	Hi I'm Katie and this vid is about the science of flight. We're going to look at how planes fly, visit a hangar where planes are modified and talk to the engineer who designs them, and then go to the university wind tunnel laboratory to check it out.
INTRO and Background	So first of all what is flight anyway, wiki answer
	So, what are all the things we know that flies flies?
	quickie video and voice over of seabirds, dragonflies, bats, blimps, balloons, helicopters, airplanes and rockets
	So the question is How?
	Early flight didn't really know the science of flight and the results were mostly bad…
	Ehh, maybe we should go talk to someone who knows
Ask an Expert	
	PAL Q&A
	Could you tell me how planes fly?
	principles of flight
	Air rushing over wings produces lift greater than weight
	Propulsion gets the airplane up to speed and keeps it there by counteracting the friction that wants to slow it down
	The different parts of an airplane do different things: rudder, airlions, flaps, stabilizers, fuselage for people, propellors or jet engines do the propelling
Phone a friend	
	University Labs
	I think I'd like to find out more about the lift and drag thing at the university
	In the lab Katie works the wind tunnel with flow vis. And sees the streamlines around an airfoil
	queue the flow vis graphic on the website Ben found.
	In the lab Katie works the other wind tunnel to see the drag forces on a plane or car
Concept Wrap up and Fun	
	Katie ends up in the big tunnel when not paying attention and is in there with hair flying, eyes closed imaging self-flight
	perhaps green screen katie flying over the cliffs of signal hill cape spear etc
Referral to Part 2	
	Katie wake up - grounded - Anyway in our next video, we'll show you how to make a model plane that flies - using the power of (pulls rubber band fromhair) a rubber band.

Some info for discussion purposes:

What flies?

The natural world





Human endeavor




How?

Q & A at PAL with Maurice Clark – chief engineer

Hands – on:
Drag, Lift, Propulsion, Gravity

Lets check out the Lab?

Visualize it in the Lab

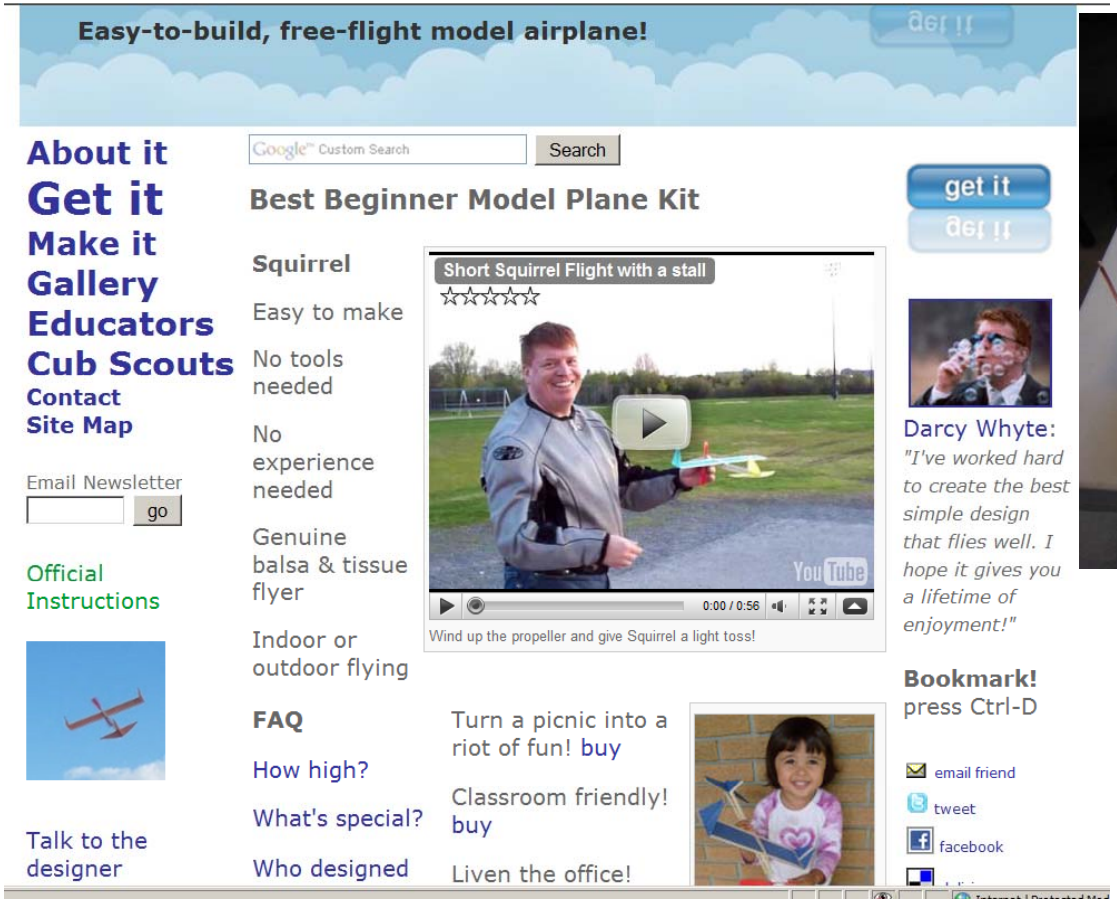
Katie IN the Tunnel

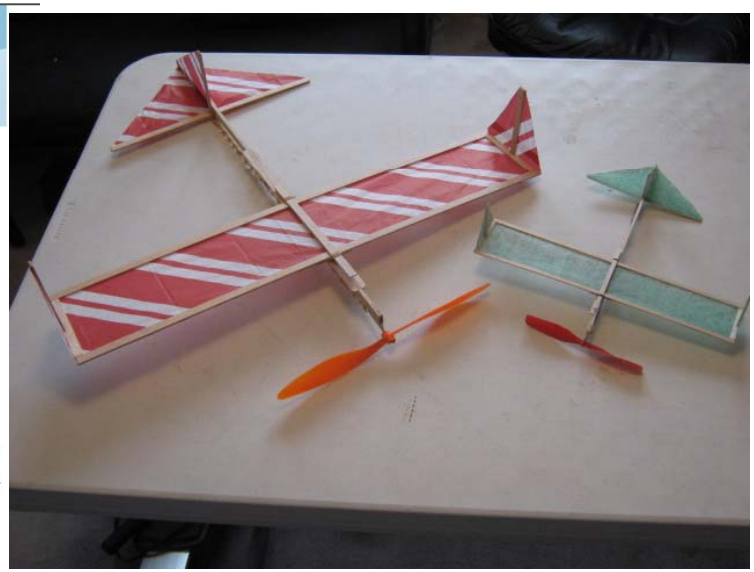
In Katie’s mind

Video 2 (of 2)

http://www.rubber-power.com/

Make it Fly





Appendix C

Questionnaires for Students and Teachers

Teacher Evaluation Form
Course: Grade 6, Physical Science: Flight

School: _____

Description: Memorial University's Distance Education and Learning Technologies, Faculty of Engineering and Applied Science and Let's Talk Science have produced two videos that will serve as supplementary resources for the unit on Flight in the Physical Science course. One video illustrates the concepts of flight in an effective and interesting way, and the other is an instructional video of how to make and alter a model airplane for optimal flight.

We would like your feedback on the level of satisfaction and effectiveness of the two videos in enhancing student's interest and understanding of the concept of flight. This input will be used to evaluate the possibility of producing additional video resources for other units of Physical Science as well as for other courses.

Thank you for participating in this project.

Video 1: Flight Concepts

1. How effective was the video in illustrating the concepts of Flight?
   □ Very effective □ Somewhat effective □ Not at all effective

2. Did you find the video improved your students understanding of "Why Airplanes Fly?"
   □ Yes Why? _____

   □ No Why Not? _____

3. What was your overall level of satisfaction with this video?
   □ Very satisfied □ Somewhat satisfied □ Not at all satisfied

4. What were the strengths of this video?

   _____

   _____

5. What can be improved with this video?

   _____

   _____

Video 2: Model Airplane Activity

1. How effective was the video in providing instructions on how to make a model airplane?
   □ Very effective □ Somewhat effective □ Not at all effective

2. Did you find the model airplane activity improved your students understanding of "Why Airplanes Fly?"
   □ Yes Why? _____
   _____

   □ No Why Not? _____
   _____

3. What was your overall level of satisfaction with this video?
   □ Very satisfied □ Somewhat satisfied □ Not at all satisfied

4. What were the strengths of this video?

   _____

   _____

5. What can be improved with this video?

   _____

   _____

Student Feedback Form
Course: Grade 6, Physical Science: Flight

School: _____

Thank you very much for participating in a video project from Memorial University on the topic of Flight. Would you please provide your feedback on the two videos shown in your Physical Science Class today?

1) Did you like the video on Flight Concepts?
   □ Very much □ Somewhat □ No, I didn't like the video

2) If you did like the video on Flight Concepts, what is one thing you learned?

   _____

   _____

3) What was your favorite part of the Flight Concepts video?

   _____

   _____

4) Did you like the video that showed how to assemble a Model Airplane?

   □ Very much □ Somewhat □ No, I didn't like the video

5) What was your favorite part of the Model Airplane instructional video?

   _____

   _____

6) What was your favorite part of the presentation today?

   _____

   _____

Thank-you again for watching our videos on the topic of Flight!!