

# My e-Backpack

Can handheld devices increase engagement and student achievement  
at Riverview Middle School?



School District 2  
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## **Acknowledgment**

The My e-Backpack research project was an amazing experience through which we have gained a better understanding of the impact of mobile learning on the education system. I would not have been able to do this project without the support of many key players who contributed to this project.

I would like to acknowledge all the stakeholders: Red Ball Internet who provided Internet access on field trips; the New Brunswick Department of Education for providing the necessary network equipment for the connectivity at the school and release time for the professional development for all the teachers in the project; Apple Canada for providing the training to our teachers, technicians, and technology mentors involved in the project; Riverview Middle School students, teachers and the school administrator for making the commitment for two years. I would like to thank all the district teachers and school administrators who have played a very important role in the first phase of the research project by responding to a survey and administering a student survey.

I would like to also acknowledge the advice, contributions and guidance of Dr. David Silvernail. His experience and expertise played a vital role in the success of this research project.

Most of all, I would like to acknowledge the commitment and support of my district for giving me such an opportunity to broaden my knowledge, expertise and experience in the Information Communication and Technology (ICT) field.

## A Collaborative Project

The realization of this project was based on a collaborative initiative involving many partners in the learning community. The partners included: School District 2, New-Brunswick Department of Education, Riverview Middle School, Apple Canada, Red Ball Internet, Dr. David Silvernail from the University of South Maine, students and parents of Riverview Middle School community.



### Stakeholders:

#### School District 2:



School District 2 is the largest district in New Brunswick serving over 16,000 students in 38 schools. Geographically, the district is located in [south-eastern New Brunswick](#), covering municipalities as far west as Havelock and as far north as Sainte-Marie-de-Kent, including Salisbury, Petitcodiac, Alma, Hillsborough, the Greater Moncton area, Cocagne, Shediac, Sackville, and Port Elgin. The District has been the primary contributor to this research project by providing the necessary infrastructure equipment and allowing students and teachers to share resources within the school and other schools in the learning community.

#### Riverview Middle School:



The school provides services for approximately 820 students enrolled in grades 6 through 8 who reside in the Town of Riverview and the surrounding rural region. The school offers instruction in English and French Immersion.

#### Department of Education:



The English Educational Services Division of the Department of Education and Early Childhood Development includes Curriculum Development, Professional Learning Services, and Student services,

evaluation and assessment. The overall responsibility of the Educational Services Division is to lead and facilitate system change where needed, encouraging professional learning at all levels of public education in New Brunswick. As of September 2010 there were 224 English Schools in the province distributed among 9 English school districts with an overall student enrollment of 74, 579. The Department of Education provided release time for one PD sessions for the seven teachers and covered expenses for one field trip associated with the learning activities. The Department of Education have also provided additional resources to support classroom instruction.

**Red Ball Internet:**



Red Ball Internet is a company who's goal is to help reduce costs, create new revenues and improve customer service through turnkey, Advanced GPS Tracking and Onboard Connectivity systems. All delivered seamlessly on high-speed, 3G or 4G wireless networks.

This company provided three mobile access points (AP) where students had access to the internet with their handheld device on field trips.

**Apple Distinguished Educator - Apple Canada:**



The Apple Distinguished Educators (ADE) program was created to recognize K-12 and higher education pioneers who are using a variety of Apple products to transform teaching and learning. Today it has grown into a worldwide community of visionary educators and innovative leaders who are doing amazing things with technology in and out of the classroom. That includes working together – and with Apple – to help bring the freshest, most innovative ideas to students everywhere.

## Research and Support Team

### Research Team

Mario Chiasson, M. Ed.



Mario is the K-12 Technology Learning Specialist and ICT (Information and Communication Technology) Coordinator for School District 2 in Moncton, New-Brunswick. His responsibilities include providing a vision and direction for the use of ICT administratively and pedagogically (K-12) in the district. He also leads the strategic ICT planning to achieve district goals by identifying and prioritizing development initiatives supporting 21<sup>st</sup> Century Learning.

Mario started in 1997 as a French Immersion teacher. In 2002, he became a Technology Mentor for the district and provided professional development sessions in ICT integration to teachers, school administrators and Learning Specialists. In 2004, Mario completed a Masters Degree in ICT in school administration. He has been involved in many provincial projects: 1-to-1 laptop project, provincial and district collaborative platform (Portals) as well as international collaborative projects to name a few. In 2008, Mario was selected to go to Cameroon Africa as the Canadian ICT Specialist and provided training session to the teaching staff at the college called "Centre Professionel Don Basco de Mimboman". Mario was also selected to be a judge for the Microsoft Innovative Teacher Award in 2007 and 2008 (Microsoft Canada - Partners in Learning). Mario is an Apple Distinguished Educator and Apple trainer. He is presently a member of the board of the Apple Distinguished Educator program (Apple Canada). In the My e-Backpack project, Mario is leading the research study.

Dr. David Silvernail



Dr. David L. Silvernail is Director of the Center for Education Policy, Applied Research and Evaluation, and Professor of Research and Evaluation at the University of Southern Maine. Dr. Silvernail has over 30 years of research and education policy experience in the fields of school finance, school reform, and large scale assessment. In early 2000, he was lead research analyst for the Maine State Board of Education and the Maine State

Legislature in the development of a new adequacy basis school funding formula for Maine. Currently Dr. Silvernail is conducting several research studies related to laptops, mathematic education, and high performing schools.

Offering his knowledge, advice and guidance, Dr. Silvernail worked collaboratively with Mario Chiasson. His experience and expertise played a vital role in the success of this research project.

### **Support Team**

Geoff Douglas, IT Manager, and Marc Legere, Technician Level 2



Geoff (left) has 12 years experience as a technician. The last six years have been in the role of District IS Manager. Marc (right) has 9 years as a technician and is presently in the role of Technician Level II. They lead the School District 2 IT Department. Working closely with the province, they were responsible for setting up the wireless network infrastructure and internet connectivity for students and teachers.



Richard Daley and Shane Sturgeon, Technology Mentors



Richard (left) and Shane (right) started their careers as high school teachers. They both became District technology mentors and for many years have provided technology related training to teachers, school administrators and learning specialists at School District 2. They were responsible for providing professional development to the teachers involved in the



project.

## Project Overview

In September of 2009, students and teachers from Riverview Middle School embarked on a two year unique journey utilizing Apple iPod touch as a resource tool to improve learning in the areas of literacy and numeracy.

Students participated in a RAFT learning environment (Remote Access Field Trip) as teachers developed and implemented lessons utilizing the handheld devices. Students and teachers used their handheld device as a tool to extend, enhance, and enrich their learning. Students on field trips had access to the Internet to search, explore, investigate, experience, discover, collect data and share it on a virtual collaborative platform (Provincial Portal) so all students from the learning community could benefit from those resources. Students found, developed and created information relevant to the subject (curriculum outcomes) and produced high quality curriculum work. In this learning environment students were expected to communicate and collaborate with each other to accomplish learning tasks and beyond. One example of this involved students at school creating graphs based on the data generated by the students on the field trip. Students reflected on their learning by writing in journals, blogs and/or work assignments to which teachers had access for virtual monitoring and assessment.



“No bells, no walls and no borders and yes to anyplace, anytime learning!”

Based on the evolution of Information and Communication Technology (ICT), the district wanted to investigate and compare the impact of mobile learning on the educational system by observing French Immersion and English student’s behaviour and achievement in the areas of literacy and numeracy. The district also wanted to understand how the education system can adapt to mobile learning. Finally the District wanted to explore and implement a RAFT learning environment (Remote Access Field Trip).

## What do we know about handheld devices?

Before exploring the world of mobile devices, especially the area of handheld devices, it is important to explain what Information and Communication Technology (ICT) is all about. ICT tools are basically any device capable of transferring data wirelessly or while physically connected to the Internet. Some examples of ICT tools includes: cell phones, smart phones, Nintendo DS and DSi, netbooks, notebooks, desktop computers, PS2, PS3, XBox, iPod touch and iPad.

The evolution of ICT has certainly created some turbulence in education systems around the world, especially in the area of the handheld device. In fact, as part of the preliminary phase of this research project, our school district surveyed 4553 students from grades 3 to 12, 618 teachers and 72 school administrators to determine what tools they are currently using and how they are being used. The findings were very interesting and revealing.

Table 1: Handheld device survey results

Handheld Devices	Students (3-5)	Students (6-8)	Students (9-12)	Teachers	Admins
Cellphone	19%	79%	83%	89%	91%
Smart Phone	7%	32%	39%	32%	38%
iPod touch	36%	49%	59%	22%	30%
iPad	2%	3%	6%	NA	NA

From a high school perspective, it was not a surprise to see that 83% of high school students (9-12) owning a cell phone. Interestingly, 39% have Smart Phones, while 59% have an iPod touch. At the middle school (grade 6-8) level, it was quite interesting to discover that 79% of the student population has a cell phone, with 32% of them using a Smart Phone and 49% having an iPod touch. It was also interesting to discover that the percentage of cell phone and smart phone ownership from grades 6 to 12 is almost the same.

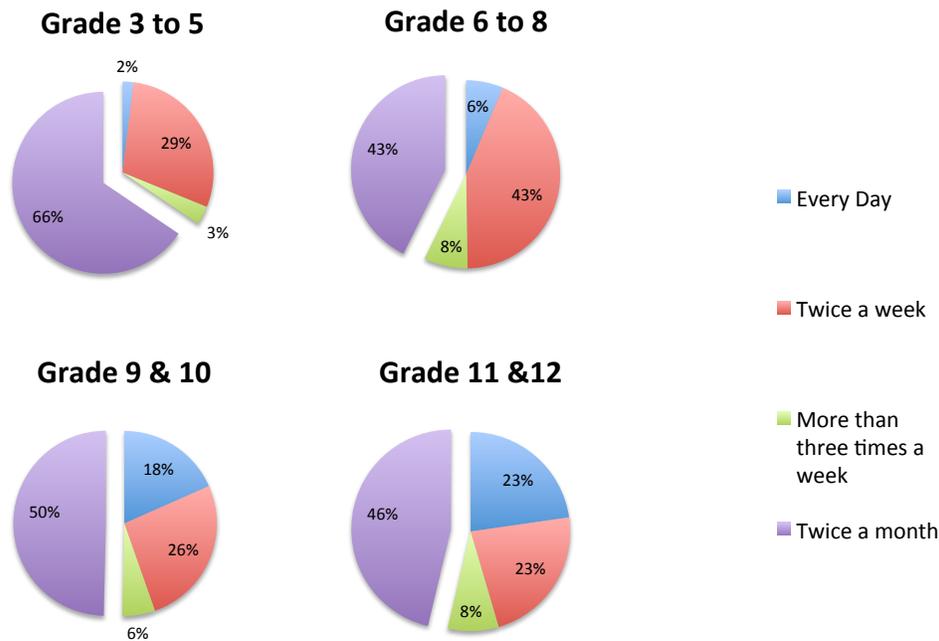
At the elementary level, 36% of students in the grades 3 to 5 have an iPod touch. It is important to note that the iPod touch has only Wi-Fi connectivity. With the survey revealing that 36% of elementary students have an iPod touch, this raised a question about the wireless connectivity at home. Based on the district survey to which 4553 grade 3 to 12 students responded, 58.2% have wireless Internet at home, 30.7% have a computer with High Speed Internet, 4.4% have a computer

with Dial-Up Internet, 3.8% have a computer with no Internet and 2.9% do not have a computer at home.

One of the questions on the student survey related to the frequency of computer lab use and the type of activities they were engaged in while there. The survey indicated that Internet research, word processing and developing PowerPoint presentations were the predominant activities of students going to the lab. It was astonishing to find out that 66% of grade 3 to 5, 43% of grade 6 to 8, 50% of grade 9 & 10 and 46% of grade 11 and 12 students were going to the computer lab only twice per month.

Despite the fact that a significant number of students have personal handheld devices capable of accessing the Internet, they did not have permission to use their ICT tools in class because of provincial department and/or district policies.

Chart 1: Access to computer lab by grade



Like many other research studies on the use of handheld devices, 49.1% of grade 9 to 12 students are spending more than two hours per day texting and surfing the Internet with their handheld device. As for the middle school, 29.8% are spending more than 2 hours per day.

With these findings, it is clear that we need to explore and investigate the impact of handheld devices in the education system. By having a better understanding of the use personally, administratively and pedagogically, the education system can plan to better prepare students in this information age. The next section will explain the framework of the research project followed by the results.

## **Research Framework**

In total, Riverview Middle School has ten grade seven classes which are divided into two teams: the Pink Panthers and the Soaring Eagles. Each team is composed of three French Immersion and two English classes. During the first year, the experimental group, two homerooms from the Soaring Eagles team, was comprised of 22 French Immersion students and 25 English Program students. The control group was made up of 134 French Immersion students and 70 English Program students.

During the second year, the project was expanded in order to give all students from the Soaring Eagles a handheld device. Hence, the experimental group was comprised of 52 English Program students and 71 French Immersion students. The Pink Panthers, the control group, had 51 students enrolled in the English program and 76 in the French Immersion program. For the duration of the project, both grade 7 teams shared one resource teacher who also had a handheld device to use only with the experimental group.



The teachers involved did daily reports indicating how many minutes students used their handheld device during instructional time, which “App” they used and in which subject. As for the literacy and numeracy assessments, the grade 7 teams used the same common summative assessments and student report card during the course of the two years.

During the two year project, forty-five hours of classroom visitation was conducted to observe students’ attitude and behavior with regards to using their handheld device. Twenty-five interviews were conducted with students to collect data on their experience using a handheld device. All of the teachers in the experimental group were interviewed in June of each year.

Students and teachers used two wiki sites (<http://e-backpack.wikispaces.com> and <http://mye-backpack2.wikispaces.com>) to measure and monitor collaborative activities and student work. Attendance reports were collected at the end of each year. Students had access to their handheld device from the first week of December through the first week of June.

As for the school administrators, 23 out of 84 school administrators indicated their interest in participating in the project. Five principals and five vice-principals were selected for a total of ten. They used the device as a communication tool to facilitate the sending and receiving for e-mail, contacts, notes, calendar and data collection. Interviews were conducted at the end of each of the two years to investigate the use of their handheld device at school.

The parents were also involved as partners in the project. At the beginning of each year, they were provided information sessions about the research project and to familiarize each parent with their child's handheld device. During the session, parents learned, explored and discovered the instructional uses of the handheld device.



### **Overview of a Typical Day**

Each homeroom teacher had a class set of handheld devices with a charging/syncing docking station. Every night, each teacher was responsible for charging the devices and locking them in a secure place. Each of the experimental group's classrooms had one laptop and one access point (AP) for internet connectivity. As for managing the "Apps" on the devices, students could request "Apps" to be installed on the handheld device, however, one teacher on the experimental team was responsible to install requested "Apps" on the devices.

On a daily basis, students in the experimental group picked up their handheld device from the homeroom class. Each device was labelled so the students used the same one daily. Students also had a small pouch to store their device, headset and microphone.

## **Teacher Professional Development and Resources**

Over the two years, classroom teachers and the resource teacher of the experimental group received two hours of professional development per month from the technology mentors. They also received a full day training from the official Apple trainer and participated in an Apple Distinguished Educator conference.

The main topics of the professional development included; how to incorporate Challenge and Project Based Learning into teaching practices, implementing and utilizing the handheld device as an instructional tool, and increasing teacher knowledge on the use of their laptop applications and handheld devices.

The following materials and equipment were used for the research:

- 138 iPod touch Gen. 2
- 150 Otter Box iPod touch cases
- 50 small bags
- 30 mini microphones
- 138 earphones
- Six MacBooks
- Five docking/sync/charging stations
- Five access points
- Mobile Access Points
- Four Flip Cams



With regards to the school administrators professional development, they received their handheld device during the first week of September of the first year. They also received a half day of training and two after school sessions.

## **Research Question and Focus Areas**

“Can handheld devices engage and increase student achievement at Riverview Middle school?” To answer this question it was necessary to investigate four major components:

### **1. Computer Lab vs Handheld**

The first component compares the two different learning environments and the pedagogical practices used to teach the curriculum outcomes. Does the experience of the student using the handheld device differ from the experience of the student using a computer in the lab?

### **2. Mobile Learning Environment**

The second component investigates the activities of students using handheld devices in class. How are they communicating and collaborating to accomplish curriculum related activities? How are they in charge of their learning?

### **3. Achievement**

The third component explores the relationship of handheld devices used by the teachers and students with respect to their achievements. Is there an increase of student achievement in literacy and numeracy? How does the use of the handheld device affect struggling learners? From a teacher perspective are they reflecting individually and collaboratively on their teaching strategies related to the use of the handheld device? How are they adapting differentiated instruction?

### **4. Living Experience**

The fourth component examines the attitudes of the students, teachers and school administrators towards the use of handheld devices. From a student perspective, how do student attitudes differ toward the use of their handheld device in the English and FI programs? Does the use of the handheld device affect student attendance? How are students more motivated to be innovative

and creative using their handheld device? With respect to teachers, how are they motivated and encouraged to learn more about how to use the handheld device pedagogically? As far as school leadership is concerned what are the administrative impacts of using a handheld device within a leadership role? Are administrators encouraging and supporting the use of the handheld devices in the classroom?

These four components have been researched and studied in order to give a better understanding of the impact of mobile devices. The following sections will bring forward results, observations and the data collected during this two year study.

## Results

This section will discuss students' learning experience as well as their literacy and numeracy achievement results, teacher's experience using handheld devices in class and the leadership experience of administrators using their handheld device as a communication and data collection tool.

### What a day for the students!

It was quite a memorable day when students received the handheld device for the very first time knowing they could use it as a learning tool. On December 1, 2009, students as well as teachers were excited and looked forward to using the devices in class.

At the beginning, it took a few days to develop a systematic process to manage the handheld devices in class and, after a few changes in classroom management, things went well. The biggest challenge was when students returned to their homeroom following their last class of the day and needed to place their handheld device in the dock station before going to their lockers. One other challenge was that some students' handheld device lost wireless connectivity during class. Teachers needed to show students how to reconnect to the wireless. Therefore, instructional time was lost.

On a daily basis, students could use their handheld device for the whole day including before school, during break and lunch. Students also used their handheld device in physical education, music and art classes. They preferred to use their pockets to transport their devices instead of the pouch provided. Internet research, wiki, e-mail, blog, Twitter, calendar, calculator, dictionary, online video and spreadsheet applications were tools the most used in class.

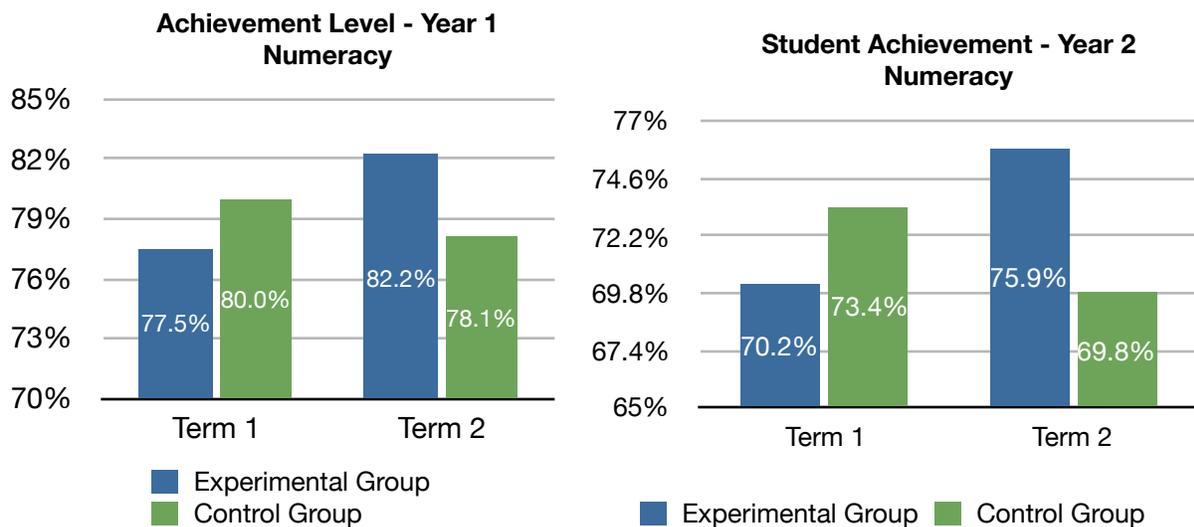


One of the focus areas examined was student access to online information. It was fascinating to discover and compare the data between the two groups. Students in the experimental group had access to information at all times. However, of the students in the control group, 62.1% had access to a computer only once per month and 21.4% twice per month. In addition, this lack of computer lab time made it difficult for the teachers to plan ahead and prepare their lesson plan.

The handheld devices had a significant impact on student behaviour and attitudes. As indicated previously, the grade 7 teams had three French Immersion and two English classes. The English classes had the reputation of being difficult to manage. However, based on the 45 hours of classroom observations, it was astonishing to observe that there was almost no difference in student behaviour and attitude between the English and French Immersion programs when they used their handheld device. It was interesting to observe that some students who had previously exhibited difficult to manage classroom behaviour became more focused on their learning and frequently helped their classmates.

The use of handheld devices as an instructional tool also had a positive impact on student achievements. Common summative assessments and student report cards were used for each year as a measures of student achievement. It is important to note that during the first year, student achievement results from the exploration classes (2 classes) were collected and compared with 5 classes from the control group. In the second year, 5 classes in each group were compared. The following graphs demonstrates the literacy and numeracy achievement results.

Chart 2: Numeracy Student Achievements



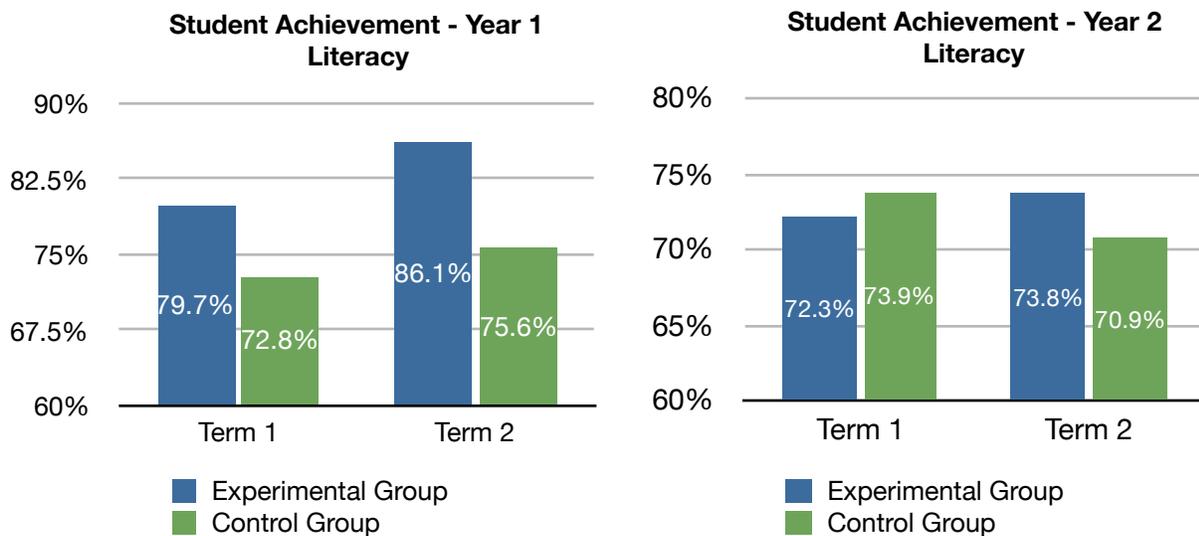
From a numeracy point of view, students achievement in the experimental group during the first year increased by 4.7% while achievement in the control group decreased by 1.9%. As for the second year, the experimental group increased their achievement results by 5.7%, whereas the control group decreased by 3.6%.

Having said that, it seems that during the second year, the handheld device had a more significant impact on student learning. Also, it is interesting to observe a similar pattern after two years where the control group had decreased performance while the experimental group's performance improved.

During the interviews with students, one comments that reiterated by students mentioning was that they regularly used numeracy “apps” and watched videos with their handheld device to review and to reinforce their learning during recess, lunch and numeracy classes. One student stated that once the teacher set the lesson plan on the wiki, “you didn’t really need them because we could learn on our own.”

In regards to literacy achievement, the use of handheld devices did not have the same impact as seen with numeracy. In year 1, the experimental and control groups have improved their achievements. The experimental group had a significant increase of 6.4% while the control group increased by 2.6%. In year 2, the experimental group increased its achievement by 1.5%, whereas the control group’s achievement decreased by 3%.

Chart 3: Literacy Student Achievements:



It was encouraging to discover that the numeracy and literacy results did increase in the experimental group for year 1 and year 2. However, it certainly raised some questions about the use of handheld devices with regards to student achievements in literacy. The fact that students in the experimental group had a significantly greater increase of performances in numeracy in comparison with

literacy, prompted us to explore what differences are in the use of handheld devices between subjects.

To investigate that question more closely, teachers did daily reports indicating how many minutes student used an “app” to do an instructional activity in numeracy and literacy classes. From this data collected after two years, it was found that students spent 12 090 minutes using an “app” in numeracy classes and 6815 minutes using an “app” in literacy. The school had 50 minute periods for both literacy and numeracy and the average time per period spent by students using the handheld device in literacy was 24.5 minutes during year 1 and 28.5 minutes in year 2. As for numeracy, students spent an average of 29 minutes in year 1 and 39 minutes during year 2.

Having said that, it was interesting to discover that students used their handheld device 43.6% more in numeracy than literacy.



Further more, during year 1, the handheld device was used 4.5 minutes more in numeracy compared to literacy and 10.5 minutes more during year 2. Summative assessment results also demonstrated that students performed relatively better in numeracy than literacy which

correlates to their increased numeracy achievement. Of course, there may have been other variables that contributed to the increase in student performances. However, we believe that the use of handheld devices positively impact students’ motivation and engagement which, generated an impact on their results.

It was clear that students from the experimental group were more motivated and engaged in their learning. In fact, 86.8% of students loved their handheld device as an instructional tool. One student from Mr. Le Blanc’s class commented: “I like learning with the iPod touch because it helps me with my work and if I can’t get something like logging on to the wiki, the teachers always help me with it. Also, I like to be able to go on the wiki at home and see what I have to study or if I have a test the next day its very useful to me and I love the iPods.” Another student from Mrs. Terry’s class said: “It helps us learn because we have easy access to the Internet.” and another student stated: “Comes in handy!”

The wiki sites were the main locations where students did their work and also collaborated with their peers. Some students worked late at night and early in the morning. In fact, some posts in the discussion section were as early as 4:47

am in the morning (<http://e-backpack.wikispaces.com/message/view/Math-LeBlanc/16943403>). They also enjoyed sending their assignments by e-mail to their subject teachers.

As previously stated, 45 hours were spent in classroom observation. The most amazing observation was made was when students were asked to watch an online video. Some students reviewed the video up to three times before continuing their activity. When asked why, they simply mentioned that they had not understood the message or the concept in the video and they needed to watch it again. In addition, some students went back and reviewed the video while they were doing the task. How many times have we shown a video just one time in class?

On another note, when students were given a learning task by the teachers, some students used only one “app” while others used up to three “apps” to accomplish the task. What a great example of differentiated instruction!

During the student interviews, we discovered (1) students like to learn in a dynamic environment where they are engaged in their activities instead of listening passively; (2) want to receive instant feedback; (3) like to communicate and publish their learning with ICT ; (4) like to compete collectively and individually and finally; (5) want to learn how to make money. It was not a surprise that students loved to publish their work. When blogging, students took pride in their work because people all around the world could read it. But most importantly, the fact that they could receive comments by others seemed to be a game changer with regards to the effort they put into their work.

It was also interesting to hear from students that they couldn't use their handheld device whenever they wanted. By default, this created some frustration with the students because they wanted to use their handheld device to accomplish their learning task. After investigating further, it was clear that the level of knowledge, experience and comfort on how to integrate the handheld device pedagogically by the teacher was one of the main reasons. Students expressed that some teachers didn't know how they could use the handheld device in class and, as a result, teachers controlled and managed when students could use their handheld device. Students would have loved to use their handheld device to find other ways to do their learning.

It was clear that students wanted to have more freedom with their handheld device, such as downloading and listening to music while working, play games

and exploring and downloading “apps”. They also indicated that depending on the task, having a wireless keyboard would have made it much easier to accomplish their assignments.

As for attendance, there were no significant differences in attendance between the experimental and control groups. One reason for this lack of impact on attendance may be that 49% of the experimental group already have a personal handheld device and it seems to be already embedded in their personal lives.

To conclude, students really appreciated using a handheld device as an instructional tool. Based on the data collected, there was a positive impact on their learning and behaviour. Students were definitely more engaged in their learning and willing to communicate and collaborate with their classmates.

### **Quite a learning experience for the teachers:**

Before we start to reveal the teacher experience with the use of handheld devices in class, it is important to mention that there were no pre-selection or requirements to be part of the experimental group. Almost all teachers had the same set of Information and Communication Technology (ICT) skills, knowledge and experience.

As mentioned previously, all teachers were excited to be part of the research project. However, 85% of them were extremely intimidated and they had no idea how they would use their handheld device in class as an instructional tool. They all agreed that their post secondary education institution had not prepared them at all to implement and integrate ICT tools pedagogically.

To provide some level of comfort, all the teachers, including the resource teacher, received bi-monthly PD of one hour after school by the tech mentors. After all



that training, 85% of them indicated that it wasn't nearly enough. They all stated they wanted and needed more time for PD sessions and time to go observe other classes where mobile learning is fully integrated. In addition, 85% of the teachers expressed that they would have greatly appreciated having lessons modeled by the tech mentor to have a better understanding on how to

use the handheld devices in the classroom.

In addition, giving all students a handheld device in class could potentially be disruptive and problematic. In fact, 67% of teachers expressed classroom management challenges because students were not on task all the time. Some examples were surfing the Internet and chatting. Also, 85% wanted to control/restrict use of handheld devices to assure the learning outcome was reached.

Teachers implemented Project Based Learning (PBL) as a teaching methodology. This represented the biggest challenge for all the teachers because it takes a lot of time and energy to prepare a meaningful project. In addition, teacher found it



difficult to change their paradigms from a teacher-centered to student-directed learning. However, after the hard work, teachers really enjoyed this new learning environment. All teachers mentioned that once the PBL was well implemented, they had more time to intervene with students requiring more support because all the students worked collaboratively to accomplish a task. They felt they

were facilitators instead of the knowledge provider. Actually Mr. LeBlanc asserted: “It would be extremely difficult to go back to traditional teaching!”

PBL worked very well at the beginning of each year. However, it took a lot of energy and time for teachers to prepare and organize projects. 85% of them indicated it was difficult to maintain such a learning environment. As a result, the majority of the teachers went back to traditional teaching because they wanted to make sure the outcomes were met.

From a differentiated instruction and personalization perspective, teachers were amazed to observe students using one, two or three “apps” to complete an assignment. In addition, they were surprised that students were watching a “YouTube” video up to three times because they did not understand the message. Actually, during classroom observation, students went back to review the videos repeatedly while they were progressing through their work.

Overall, all the teachers really enjoyed using the handheld device as a resource tool. Teachers used the e-mail daily to communicate with students and parents. Having said that, the wiki sites were the main collaborative platform where students received instructions and posted assignments (<http://mye-backpack2.wikispaces.com/M.+LeBlanc>). These activities created a game

changer for teachers in term of communicating and collaborating with students and parents.

From a resource teacher perspective, Mrs. Jessome works with many students with their handheld device. Here is a quote from an autistic student: "I like it because it's a short cut through work...makes it way easier to write a paragraph using the microphone. Unblock Me is my favorite App because it's somewhat a challenge."

Finally, teachers and the resource teacher really appreciated the support and knowledge of the technology mentors. Teachers felt they weren't doing this alone. One teacher said: "I would have never succeeded if it wasn't for the help of the tech mentors! They were always there to assist and share their ICT knowledge."

### **School Administrators - "I want to learn more!"**

When school administrators were asked to be a part of the research study, like the teachers they all accepted with excitement. However, 90% of them were intimidated by their handheld device, but they were all willing to learn, explore, discover and share. All school administrator devices were set up to use all the natives "apps", which included: Safari, Photo, Notes, iTunes, Music, Calendar, Contact and Mails. Their e-mail account was set up with an exchange server. Therefore, the Contact and Calendar "app" was synchronized with their office computer.

When they received their handheld device the first time, it was interesting to observe them looking at each other wondering what they would do with it. It was hard for them to envision what they would use it for. Some of them thought it was just an MP3 player and a game player. As for their professional development, school administrators received five hours of training from the technology mentors, and after a few weeks, they all loved their handheld devices. However, like the teachers, they all mentioned that more training was needed.



After each year, an interview was conducted with all school administrators together to gather information about their experiences. The most comment

remark during the interviews was: “We just didn’t know what we didn’t know!”. Mr. Smith, principal at Magnetic Hill School and Mrs. Matthews, from Riverview Middle School, mentioned that it provided them with more freedom to move



around the building. Mr. Smith stated with enthusiasm: “I think we’re just touching the tip of the iceberg using it and there a lot more things that can be done with it!” He went on to say: “To be able to accomplish tasks instantly while walking in the hallways made me effective and efficient”. Mrs. Matthews couldn’t agree more, stating: “It is like having my office in the palm of my hand all the time!”

However, the handheld device had some limitations. 30% agreed it was difficult to type with it because the keyboard was too small and they would have loved to have the camera/video feature. For example, while doing walkthroughs, they could have taken some video of best practices and used these clips during PD days or staff meetings. Also, because of the provincial network, they couldn’t use the Mail “app” to respond to their e-mail outside the firewall. However, they were able to access Outlook Web Exchange using the Safari “app”.

Finally, all school administrators saw the huge potential of handheld device to be used pedagogically. They saw students being engaged in their learning by communicating and collaborating with each other. School administrators feel the urgency to have more professional development opportunities so they can have a better understanding of the potential of handheld devices. On that note, because of the limited exposure or experience using them, they do not have a vision with respect to ICT use for pedagogical purposes.

## **Challenges**

Many challenges were presented during the course of the research. The major challenges included: wireless connectivity, managing the iPod touch and synchronizations of “App” and compatibility between teacher and student file sharing. The following section will provide a description of these challenges and the solutions that were implemented.

### **1. Wireless connectivity**

In New-Brunswick, the network system at schools and districts is managed centrally by the IT Department at the provincial level. In fact, NB is the only jurisdiction in North America where this platform exists. Therefore, all the wireless access points (AP), allocation of IP addresses, network filtering, user authentication and authorization are managed by the province. This environment provided a secured and reliable network system for all the schools. However, it does limit significantly the flexibility of the district IT Department to support and implement any school or district special projects.

To connect the iPod touch onto the school network, the IT Department at the district level created a specific group in Active Directory (AD) where all students involved in the project were added. This AD group granted special access to the wireless network throughout the school. Students were able to login with their credentials with the help of a technician and tech mentors. The only thing that students were not capable of doing was printing and accessing their files on the school server.

### **2. Management of iPod touch and Synchronization of “Apps”.**

When we started the project, the operating system (OS) of the iPod touch didn't have the capability to be implemented in an enterprise environment. Therefore,

it was not possible to manage the iPod touch through Mobile Device Management (MDM) software.

To resolve the situation, twice a month, one teacher of the experimental group had the responsibility of updating the OS, synchronizing the iPod touch's and installing the "apps" requested by students or teachers. It was very time consuming for the teacher to manage all 138 iPods. However, the teacher really enjoyed and appreciated having full rights and control of students' handheld devices. The teacher went on and commented that all teachers should manage their students' ICT tools.

As for the purchase of "apps", students did not have the rights to use their own personal iTunes account to buy and install any "apps" on their school iPod touch. However, they had access to the "App Store" which enable them to search for free "apps" and request the installation after explaining the education value to the teacher.

On another note, the Volume Purchasing Program (VPP) is not available in Canada, therefore, it was not possible to install individually purchased "apps" on multiple units because of the limited number of devices and "app" allowed per iTunes account.

### **3. Compatibility between teacher and student devices**

Compatibility between teacher and student devices represented the biggest challenge with respect to file sharing. Teachers each had a laptop with the Windows Operating System (OS) with Microsoft Office (Word, Excel and PowerPoint). On the other hand, students had an iPod touch with an Apple Operating System (OS), with no compatible "app" to open and edit files.

With the help of the Technology Mentors, three different solutions were implemented successfully. Wiki, e-mail and the Note "app" were used to overcome the compatibility issues. The Wiki site provided the collaborative platform where students went to receive instructions, create, publish and collaborate with other students or the teacher. When students needed to submit any work to the teacher, they use the Note "app" to send the product by e-mail.

## **Recommendations**

After surveying 4553 students from grades 3 to 12, 618 teachers, and 72 school administrators, and reviewing data from 45 hours of classroom observation, 10 school administrator interviews, 7 teacher interviews, and 25 student interviews, as well as daily handheld device usage reports, reports of wikis, attendance reports and student results, one thing is certain. The challenge facing the education system is more than just what is happening in the classroom. It is in fact a systemic challenge! By providing a mobile device to students, teachers and school administrators, it does not necessarily improve the learning process. In fact, this might create more challenges. There are six major recommendations that need to be addressed and implemented in order to successfully integrate mobile learning in schools.

1. The educational leaders such as provincial officials (ministry), school district personnel and school administrators, need to understand the term “Information and Communication Technology” (ICT) and distinguished it from the word “technology.” Most of the time when they talked about ICT tools, they used the word “technology”. In doing so, it was evident that there is a misconception of the role and impact of ICT as part of the technology evolution. Therefore, it is important to increase their ICT knowledge so that they can develop an administrative and pedagogical vision.

2. To support the first recommendation, the educational system needs to value the ICT assets of the organization. The question is, what, or more importantly who, are the ICT assets? The answer to that question is simple! Who do we call when we do have a problem with an ICT tool? That is correct! The technician. In terms of technical support, the education system needs to fade away from an enterprise solution in favour of an educational solution. Therefore, redefining the role and responsibilities of technicians by allowing them to share their knowledge, experience and expertise with teachers, school administrators and educational leaders is vital. On the same note, it is also important for teachers and school administrators to have full administrative rights on their ICT tools in order to explore, discover, learn, critique, share and understand them on a

personal, professional and pedagogical level. As a result, teachers would be more creative and innovative in their teaching practices and school administrators could more easily develop an administrative and pedagogical vision.

3. Implementing and sustaining a Technology Mentor Program is critical to assist all members of the educational community with integrating ICT tools at the district and school levels. These people are lead teachers who are passionate about ICT and possess a wealth of pedagogical experience and expertise to share with educators. Without these resource person, there are no logical reasons to move forward. Having technicians and technology mentors collaborating with teachers leads to great benefits for all members of the learning community.

4. A robust wireless network infrastructure is fundamental to ensure all members of the educational community are connected and have access to the internet. A minimum of two access points (AP) is recommended per class. This represents a significant up front cost; however it will ensure the implementation and reliability of Bring Your Own Device (BYOD) initiatives which represents a logical progression for the educational system.

5. The educational institutions need to have a strong systematic ICT plan in the area of professional development as well as infrastructure in order to safely incorporate ICT tools pedagogically. Students being “connected” totally redefines how the process of learning is done in the classroom. Consequently, it is extremely important to invest a huge amount of energy and time with teachers on how to incorporate those tools into the classroom. In addition, schools need to have an ICT team to assure maintainability of their ICT plan.

6. It is important to point out that everybody is a learner and we need to communicate, collaborate and share our resources and knowledge with all members of the educational community. Therefore, it is essential for the education system to move from a control and management working environment to a communication, collaboration and cooperation learning environment. As a result, silos between departments will gradually dissolve and stronger relationships will be created.

## Conclusion

Students, teachers from Riverview Middle School and school administrators certainly gave us an opportunity to develop an understanding regarding the advantages of using handheld devices as well as some of the challenges that need to be overcome. As many other research studies have found, it was exciting to confirm that handheld devices have a positive impact on student engagement and also on their achievement.

However, it is only fair to mention that we are at the very beginning of trying to understand the complexity of the use of mobile devices at school. With the knowledge that 32% of middle school students and 39% of high school students have a Smart phone, the educational system is faced with a difficult choices with regards to adapting their policies to take advantage of those ICT tools administratively and pedagogically.

To be globally competitive in this 21<sup>st</sup> century, students need to be critical thinkers, and problem solvers with the ability to work and learn in teams while also being innovative, creative, and complex communicators. The use of ICT tools certainly contributes to the development of those skills. Therefore, the ICT knowledge and vision of educational leaders are extremely important in order to provide leadership while working toward creating a learning atmosphere where those skills can be used.



Teachers and school administrators know very little about ICT tools. Therefore, a huge investment of time in professional development for educational leaders, school administrators and teachers is strongly recommended in order to move forward. It is also important to highlight the importance of network infrastructure for a Bring You Own Device (BYOD) program at school, which seems to be a logical progression for the educational system.

The evolution of ICT has definitely changed the way people communicate, collaborate, cooperate, and from an education perspective, the ways students can learn. Using video conferences to communicate, podcasts and blogs to publish, and collaborative platforms to share resources have created an environment where students can be in charge of their learning. With that being said, it definitely creates some questions about how, when and where students can learn. Do we need bells? Do we need walls? What about desks? Do we need high schools? What about assessments? Further more, do we really need subjects? On that note, it is fair to say that the education system as a whole is in the process of reflecting on how it can redefine the process of learning.

In conclusion, mobile learning has certainly contributed to a shift in the process of learning, and it is clear that the education system needs to have a complete face lift. Leadership, courage and commitment will be the key words in order to create a paradigm shift in the process of learning if we are to prepare students to compete globally in this 21<sup>st</sup> century. Exciting times are yet to come!