



Knowledge Network for Applied Education Research



Réseau d'échange des connaissances pour la recherche appliquée en éducation

## It's the Method that Counts: Using Case Studies and Problem Based Learning To Teach Science and Other Disciplines

**30 June, 2012**

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Case studies and Problem based learning are powerful teaching techniques. These methods can be used not only to teach concepts, but also to develop process and critical thinking skills among students. Case studies and Problem-based learning have been used in medicine, law and business schools and more recently they have been used successfully in science and several other disciplines. The use of case studies makes the content more relevant to real life.



An Ontario network promoting  
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**NATIONAL CENTER FOR  
CASE STUDY TEACHING IN SCIENCE**



**Laurentian University**  
**Université Laurentienne**

## EXECUTIVE SUMMARY

To educate scientifically literate citizens, reform in science education calls for inquiry-based, interactive methods that provide students with opportunities to solve authentic problems (Bybee, 1993). This change in practice is especially challenging in university where professors have to deliver high volumes of content knowledge to large classes. Similarly, high school science teachers tend to resort to lecture methods of teaching as the content becomes more advanced. University professors and high school science teachers need support in adopting teaching strategies that will enable them to develop process and critical thinking skills among their students. A report published by the Higher Education Quality Council of Ontario shows that a growing number of university faculty acknowledge that they need to take a more student/learner-centered approach to their teaching (Britnell, 2010).

Literature presented in this report shows that case studies and problem-based learning are student-centered strategies that have been successfully used in university teaching. Thomas Lord (2007) presented the cone of learning which shows that the lecture methods of teaching yields the lowest retention rate (4-8% compared to cooperative learning and teaching another, which yield 60-80% and 80-98% respectively. These retention rates were obtained by providing different classes with a puzzle. Each class was taught using the various teaching methods and then tested. The results from this empirical study provide the retention rates used to design the Cone.

Essentially cases are stories with an educational message (Herreid, 2007). Case studies have been used in medical and allied health fields for several decades. A robust interest in case studies and problem based learning strategies has resulted in use across several disciplines (Savery & Dauffy, 1995). Problem based learning is used in multiple domains of medical education (dentists, nurses, paramedics, radiologists, etc.) and in content domains as diverse as MBA programs (Stinson & Milter, 1996), higher education (Bridges & Hallinger, 1996), chemical engineering (Woods, 1994), economics (Gijssels, 1996), and pre-service teacher education (Hmelo-Silver, 2004).

Case studies and Problem based learning are powerful pedagogical techniques for teaching science. Case studies can be used not only to teach concepts and content, but also to develop process and critical thinking skills. Since many of the best cases are based on contemporary and often contentious problems that students encounter in the news, the use of cases in the classroom makes the content relevant to real life. As more university faculty are realizing the inadequacy of simple lectures and seeking novel methods of instruction that are student-centered, the case study approach has become a teaching method of choice. A recent study published in the journal *Science* reported that University of British Columbia physics students scored twice as high on tests after participating in case studies involving problem-

based learning compared to a group that was learning from an animated tenured professor using lecture methods (Deslauriers & Schelew & Weiman 2011).

Adoption of the Problem-based learning strategy has expanded into elementary schools, middle schools, high schools, universities and professional schools (Lehman et. al. 2006; Savery, 2006).

## **CONNECTION TO PREVIOUS RESEARCH**

Research shows that use of case studies and problem-based learning strategies can empower learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem (Savery, 2006). Case studies and problem based learning strategies provide the opportunity for small group interactions within larger classes and emphasize collaborative learning and development of analytical and higher-order thinking skills, thereby promoting long term and application-based outcomes (Strobel and Berneveld's (2009 ). Through researching the topics on their own and debating in small group discussions, students gain a sense of confidence in themselves and the material they have learned over the course of the semester (Cornelly, 1998). Use of case studies in science has been found to make the courses more interesting and relevant to the students, improve student motivation, engagement, and understanding (Hmelo-Silver et. al., 2009; Walker & Leary, 2009).

## **Effectiveness of Case studies and Problem Based Learning as Instructional Strategies**

In a study exploring the use of cases as a source of learning content and pedagogical skills, Yoon et. al. (2006) found that the case acted as a boundary object for brokering between individual experiences and those found in the science teaching community and bridging the theory- practice gap. Similarly, in a laboratory-based case study that required students to conduct themselves in the same manner chemists would in the "real world" when faced with a new and challenging problem, Schaber et.al. (2011) reported that experimental procedures developed by student teams lead to the correct identification of unknowns a majority of the time. Assessment data indicate this case study elicited positive interest and interactions among students.

In his paper, Harland (2003) describes how Vygotsky's zone of proximal development (ZPD) informed teaching in a problem-based learning (PBL) course in Zoology. Vygotsky's social constructivist view of development identifies learning as the outcome of collaborative problem-solving which is best facilitated through the use of authentic activities. This idea matches well with what is involved in PBL. The structure of PBL can encourage self-diagnosis of what the student already knows about a concept, requiring extra time for the lesson. The author suggests that students should start to develop a considered rationale for helping others learn as part of their own

development. The author found that when the students achieved a position where they could function well together and drive their inquiry forward, they seldom asked for help from the teachers. It was suggested that further research be conducted to discover new ways that students and teachers can work together in inquiry in PBL.

### **Student and Faculty Perceptions about use of Case Studies and PBL**

Ertmer et al. (1996) performed a study to explore how students of high and low self-regulation responded to learning using case studies. Interviews with the students were conducted three times during the semester to investigate the initial and changing responses of the students. The students were asked about their interest in using cases, their perceived value of cases, and their perceived confidence in learning using case studies. For the most part, the students thought that the cases were interesting and had value, especially since they had clear connections to real life situations. In addition, the confidence level of the students seemed to increase as they became more comfortable with the problem solving method.

Yadav et al. (2007) conducted a survey of university and college science faculty to determine what they perceived as benefits and challenges to using case studies. The participants were selected from faculty who attended a workshop conducted by the National Centre for Case Study Teaching in Science in 2005. After the conference, most (84%) of teachers indicated that they used case studies in their teaching, with 88% of these teachers using between one and five cases per semester. Three significant benefits of using case studies that teachers reported were that students' critical thinking increased, students gained a better understanding of the practical applications of core course concepts, and students participated more in class. The teachers also identified some challenges of using case studies, including a lack of preparation time, difficulties assessing students, and a lack of relevant case studies.

Sockalingam and Schmidt (2011) performed a study to identify and rank the characteristics of problems in PBL as perceived by the students. The students in the study identified eleven characteristics, the most important of which was found to be that the problems should lead the students toward the intended learning issue through the use of keywords. The least important characteristic was found to be the promotion of teamwork in solving the problem.

### **Use of Case Studies and PBL in Teacher Education**

In their study, Yoon et al. (2006) hypothesize that, using cases that demonstrate exemplary practice in the science classroom can improve teachers' self-efficacy beliefs by acting as sources for learning content and pedagogical skills. The authors found that the pre-service elementary teachers who participated in the survey indicated low self-efficacy and self-confidence in the area of science. The results of the study showed a lack of evidence showing increases content knowledge, though this might be due to the amount of time available. However, the results are more promising when it came to pedagogical content knowledge. There was evidence

showing that the pre-service teachers were trying to create links between previously acquired theoretical information and personal experience and the case scenario presented. The authors also suggest that further studies, with larger and more diverse populations, are necessary.

Findings from another study that investigated a hybrid of on-line and face-to-face problem based learning in a large class for pre-service teachers showed that students who participated learned more about targeted course concepts than students in a traditional comparison course (Hmelo-Silver et. al., 2009). In an effort to quantify the effect of problem Based learning across disciplines, Walker and Leary (2009) concluded that PBL students either did as well as or better than their lecture-based counterparts. The findings also showed that PBL students tended to do better in subjects outside of medical education. Strobel and Berneveld's (2009 ) meta-analyses of several studies showed that PBL was less effective for short-term learning, but that it was more valuable in promoting other kinds of long term and application-based outcomes. Both Walker and Leary and Strobel and Berneveld determined that when studies use assessments of measuring application of knowledge and principles, the results clearly favor PBL. In a comparative study of instructional methods, Margendoller et. al. (2006) found PBL to be a more effective instructional approach for teaching microeconomics than traditional lecture. PBL was also found to be more effective than traditional instruction with students of average verbal ability and below.

Lehman et. al. (2006) conducted a four year professional development effort to help teachers integrate problem-centered science instructional methods in their classrooms. The initiative involved meaningful driving questions anchored in real-world context and students worked collaboratively on investigations that resulted in creation of products. Evaluations of this initiative showed that the problem-based instructional methods were successful in promoting positive teacher perceptions, fostering learner-centered classroom approaches, and leading to implementation of inquiry-based science in the classrooms. In their paper, Hmelo-Silver and Barrows (2006) also discussed the goals and strategies associated with an expert facilitator in the support of collaborative learning. They developed a list of ten goals for the facilitator, including pushing for explanation, revoicing, and summarizing. In pushing for an explanation, the facilitator tries to draw out explanations from the students by using guiding questions or statements. Revoicing involves the facilitator restating what the students have said. Summarizing could be used when the facilitator notices that the process is stalling or to ensure that all students are involved. Although these goals and strategies were developed using a medical case, they could easily be adapted for any case type.

## **Case studies and PBL University Initiatives**

The following are examples of universities that have developed case study and PBL instructional resources for educators. The University of Delaware in Delaware, USA

(<http://www.udel.edu/pbl/>) has an active PBL program and conducts annual training institutes for instructors wanting to become tutors. Samford University in Birmingham, Alabama (<http://www.samford.edu/pbl/>) has incorporated PBL into various undergraduate programs within the Schools of Arts and Sciences, Business, Education, Nursing, and Pharmacy. The Illinois Mathematics and Science Academy (<http://www.imsa.edu/center/>) has been providing high school students with a complete PBL curriculum since 1985 and serves thousands of students and teachers as a center for research on problem-based learning. The Problem-based Learning Institute (PBLI) (<http://www.pbli.org/>) at Southern Illinois University has developed curricular materials (i.e., problems) and teacher-training programs in PBL for all core disciplines in high school (Barrows & Kelson, 1993). Colorado State University's open learning environment has a link to a guide on how to write case studies: <http://writing.colostate.edu/guides/research/casestudy/>.

For the past two decades, the National Center for Case Study Teaching in Science at the State University of New York at Buffalo has promoted the development and use of case studies in teaching science. With financial support from the National Science Foundation, The Pew Charitable Trusts, and the U.S. Department of Education, the center has developed a virtual library of peer reviewed case studies that are freely available for use by all educators. Their website <http://sciencecases.lib.buffalo.edu/cs/about/> provides access to an award-winning collection of peer-reviewed case studies. They offer a five-day summer workshop and a two-day fall conference to train faculty in the case method of teaching science. In addition, they are actively engaged in educational research to assess the impact of the case method on student learning. Dr. Clyde Herreid, director of the Center for Case study teaching in science has presented numerous workshops to university faculty and science teachers and he has authored two books and numerous peer-reviewed articles on case study teaching.

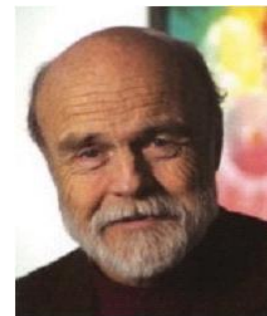
## **THE ONTARIO MINISTRY OF EDUCATION KNAER GRANT INITIATIVE: USING CASE STUDIES TO TEACH SCIENCE AND OTHER DISCIPLINES**

During the 2011-12 academic year, the Laurentian University School of Education received a KNAER grant from the Ontario Ministry of Education that funded two case study workshops. We invited Dr. Clyde Freeman Herreid, an expert in using case studies and problem-based learning to present workshops to university faculty, high school science teachers, graduate students and pre-service teachers. Dr. Herreid has been using case studies to teach science for twenty years. He received his PhD in Zoology and Entomology from Pennsylvania State University and he has authored more than 150 publications which include 4 books on ecology, behaviour, physiology, and anatomy. Most recently Dr. Herreid has become a distinguished teaching professor and director of the National Center for Case Study Teaching in Science at the State University of New York at Buffalo (<http://sciencecases.lib.buffalo.edu/cs/>). He has received over \$2 million in grants from the U.S. Department of Education, Pew

Charitable Trust, and the National Science Foundation to further the development and dissemination of case studies in teaching science. The “Center for Case Studies” has developed an online repository of peer-reviewed case studies. Dr. Herreid has authored two books on use of case studies.

The goal of bringing Dr. Clyde Herreid to Northern Ontario was to provide educators the opportunity to learn how to design and use case studies and problem based learning to teach science and other disciplines. Case studies and problem-based learning are essential higher order strategies for inquiry-based learning. Educators in Northern Ontario have not had the opportunity to learn about using case studies; hence this grant greatly helped in providing some essential experiences for educators.

During his visit to Northern Ontario, Dr. Herreid hosted workshops for high school science teachers, pre-service teachers, college instructors and university faculty from across Northern Ontario. The academic fields represented include: science and technology, anthropology, astronomy, biology, chemistry, computer science, health sciences, earth science, engineering, mathematics, medicine, nursing, physics, psychology, and science education. The workshops introduced participants to case studies, how to use cases in teaching and how to write case studies. Dr. Herreid also shared teaching resources that are available on the Center for Case Study Teaching website. Hence the ultimate purpose of this initiative was to disseminate knowledge about teaching strategies that enhance learning in elementary, high school, college and university teaching.



**Dr. Clyde Herreid**

## **Project Description**

The main objective of this project was to disseminate research knowledge and resources that have been developed to enhance student learning in science-based and other fields. Dr. Herreid's workshops focused on designing and using case studies and PBL strategies to enrich learning in high school science and university courses. During his visit, Dr. Herreid hosted two one-day workshops for teachers, faculty and graduate students and one round table discussion with faculty from the Northern Ontario School of Medicine. The first workshop was conducted on March 1, 2012 for High school science teachers, college instructors, university faculty and informal science educators from across Northern Ontario. Workshop 2 was conducted on March 2, 2012 for graduate students and pre-service teachers from Laurentian University. The workshops were hosted in Sudbury at Laurentian University and video-conferencing was made available to participants in remote areas via the contact North sites. As part of the workshops, a toolkit consisting of DVDs from the workshop and short explanations on how to develop and use case studies was developed. The toolkit will be made available to school boards and universities for disseminating to

interested practitioners. A complete toolkit will also be posted on the Laurentian University School of Education website. A complete toolkit including this report will be submitted to the Ministry of Education for dissemination in June 2012.

## **Alignment with Ministry Priorities**

The visit by Dr. Clyde Herreid assisted in answering many important questions from the Ministry of Education's priority area on Teaching and Learning such as: a) What are the most authentic and effective strategies for developing critical thinking and investigation skills among elementary/high school and university students?; b) What is working in science instruction in Ontario and elsewhere and what does research say about these strategies?; c) To what extent are research-based instructional strategies being implemented in schools and post-secondary science courses? d) Are available resources being used effectively to teach science in more meaningful ways that promote inquiry skills? e) What do we know about effective assessment and evaluation practices that promote understanding in science? This project helped answer some of these questions by inviting a 'world class' expert to act as a 'knowledge' broker and to facilitate and lead the spread of established teaching strategies that have been found to be effective in complementing the traditional lecture method. This initiative helped promote collaboration and networking among school boards, universities, colleges and policy makers in their efforts to apply research to practice and to increased confidence in publicly-funded education.

## **Partnerships**

The aim of bringing Dr. Clyde Herreid, a 'world class expert' in using Case Studies and Problem-based Learning strategies to teach in science and related fields was to support the development of authentic learning among students and to establish networks among elementary and high school science teachers; post-secondary faculty; college faculty and educators in the informal sector. This initiative also helped to create a partnership between the National Center for Case Studies Teaching in Science and many educational institutions/school boards across Northern Ontario. By embracing the writing and sharing of case studies, teachers and post-secondary faculty will join a larger network of educators who are currently sharing resources to improve elementary, secondary, and post-secondary science instruction.



## KNAER PROJECT REPORT

### Description of audience

The workshop participants consisted of a diverse group of educators ranging from university and college faculty to pre-service teachers. Several post-secondary institutions were represented, including Laurentian University, Nipissing University, Algoma University, and Cambrian College. Within this group of attendees, there was also representation of various departments including Chemistry and Biochemistry, Physics, Biology, Commerce, Nursing, Human Kinetics, and Education. Secondary school teachers were also in attendance from various Northern Ontario school boards such as the Rainbow District School Board, the Sudbury Catholic District School Board, and the Near North District School Board. Science educators in the non-formal sector, from Science North, were also present.



**Teachers and educators from various institutions in Northern Ontario participating in the March 1 workshop.**



**Pre-service teachers and graduate students at Laurentian University participating in the March 2 workshop.**

Graduate students and pre-service teachers from Laurentian University attended the second day workshop.

### Successes

This project accomplished numerous feats that contributed to the overall successful workshop. Registration for the workshop was approached using a variety of methods including the use of the online registration tool at (Amiando.com), electronic and hard-copy registration forms,

personal contact, e-mail, mail, and follow-up conversations. Approaching educators using a variety of means resulted in an audience size that was beyond initial predictions but pleasantly so. Whereas we were expecting a maximum of 30 students, 76 students registered to attend the workshop on March 1, which was meant for instructors. Forty three graduate students and pre-service teachers registered to attend the workshop on March 2.

Representation of a wide range of university and college departments was achieved, as discussed in the previous section. In addition, the use of video-conferencing technology, via Contact North, allowed a Nipissing University faculty member to participate remotely.

Parts of the workshop were video-recorded to help disseminate the content further.

Finally, and perhaps most importantly, the presenter, Dr. Clyde Herreid, was able to arrive safely and on-time to give his presentation. Dr. Herreid succeeded in relating the content to a variety of subject areas to appeal to the diverse audience. He conducted the workshop in a way that enabled active participation from the participants as they worked on case studies in the same way that their own students would. Everyone actively participated and the workshops were greatly successful. Immediate feedback from the participants showed that they benefited greatly from the workshops. Participant feedback that was collected via an online survey is provided below.

## **Challenges and Solutions**

Despite the successes of this project, it was not without its challenges. Despite the larger-than-expected audience who participated in the workshop, there were several school boards who did not respond to our communications and thus prevented us from disseminating the knowledge of case studies and problem-based learning to them. We may have had better luck if we had been able to personally meet with a representative from each of the school boards rather than only sending invitations via mail and e-mail.

Unfortunately, Dr. Herreid was only able to be with us for two days so we had to group university and college faculty with high school teachers on the first day of the workshop. This proved to be a challenge because the high school teachers were outnumbered by the post-secondary faculty and thus may not have received the information in a way that would be most beneficial to them. A solution to this issue would have been to have a workshop for university and college faculty and a separate workshop for high school teachers. Although the same general information would be shared, this would have allowed the discussions and questions to focus more on items that directly affected those audience members.

Another challenge was the technology that was used during the workshop for video conferencing and video recording. There were several connection issues with the video-conferencing that were difficult to remedy on our own. It would have been beneficial to have a technician on-hand during the entire workshop that could repair any problems without disrupting the flow of the workshop.

Accomplishing this might require someone to be hired specifically for the workshop or require a change of venue to a Contact

North site where their technicians could look after everything. Having this dedicated Contact North representative could also have helped with the arrival of participants in the morning of the workshop. Apparently the Contact North sites did not open their doors very early so some participants who had arrived at the sites early left because they weren't able to wait to get into the building. Similarly, having a dedicated person to do the video recording would have yielded videos of better quality than were obtained.



**An educator participating in the workshop from a remote site via video-conferencing.**

One challenge that we faced was finding funds for food and refreshments at the workshop. Since the grant could not be used to pay for this, we had to solve this problem by paying for the food and refreshment with our own money.

Parking for the participants attending in person was also a challenge. Despite a parking lot being assigned by Laurentian University for registrants to use and parking passes being distributed, some participants commented that it was difficult to find a parking spot depending on when they arrived at the workshop. The parking process could have been streamlined by having a parking lot strictly dedicated to the registrants or by having additional parking lots available.

## **PARTICIPANT FEEDBACK**

### **Workshop Reflections from Pre-service teachers:**

Pre-service teachers who attended the workshop were asked to write a reflection of what they learned from the workshop. They were asked to provide consent if they were willing to have their reflections included in the final grant report. Below is a selection of reflections from four pre-service teachers who attended the workshop.

## *Reflection #1*

This was a phenomenal workshop which taught us that using case studies in the classroom is a beneficial teaching strategy that allows student to retain information and be more engaged in what they are learning. When you take into account the strategies such as lectures, readings, lectures with visuals, etc., it is evident that these are not effective teaching strategies to use in order for students to remember information. Using case studies allows students to analyse information or ideas that are relevant is between 75-90% effective compared to using other methods that do not engage or involve students in their learning or allow students to interact. There are many types of case studies as well as different methods that can be used in different ways to encourage students to retain information and gain their interest. Overall, this method grabs students' interest and allows them to take part in their learning and analyse information in order to take their learning further.

A case study is defined as "a story with an educational message." There are two different types of case studies; analysis cases which takes students through what happened in the story and how it occurred (contemporary and historical cases) and dilemma cases which allow students to come to a decision in the case (most engaging for students). There are also many methods that teachers can use to carry out these case studies such as through lecture, decision methods, small group methods, individual learning and large classes. I think that while there are a variety of ways to use case studies, as a teacher you need to find what works best with your students in your own classroom and go from there. I like the ideas discussed in class where a jigsaw method is used which allows students to move around or using centred case studies which allows visual and kinaesthetic learners to benefit from this type of set up and work at different case studies around the classroom. I think some of the most important parts of a case study include using relevant information that allows students to make connections and critically think through the problem. Also, they must be short, tell a story, serves a teaching function and include dialogue.

The statistics show that "92% of students are more engaged in classes compared to when no case studies are used in that class" and that "68% of students demonstrated, in some way, that they learned more in classes using case studies." I think these are amazing statistics that prove that teachers need to use this method as well as other strategies that engage students and involve them in their own learning so that they retain the information being taught and carry out their learning by actually doing an activity first hand.

I learned a lot from this workshop but mostly the importance of using this strategy in my classroom and I think students will really enjoy it. I like that Dr. Freeman took us through the steps of writing a case study and the two different ways of doing it so that we can find which way works best for us. This workshop was engaging and enjoyed not being lectured at but rather included in the discussion and able to contribute to our learning of this strategy.

*Reflection # 2*

Studies have shown that a students' retention rate is diminished when teaching material is presented in lecture, reading, audio-visuals etc. As teachers we must ask ourselves how can we start engaging our students? Although lecture based teaching is very appealing for most teachers there are several other teaching methods, which can be used within the class, for instance, case studies. A case study is a problem-based study in which students are given the opportunity to discuss and learn through doing (i.e. research, experiments, etc.).

So what is a case study? A case study is a story with an educational message and it can be told in many different ways. There were several case studies that were discussed throughout this presentation, including analysis case study, dilemma case study, directed case study. An analysis case study is when students are given the information (i.e. readings, videos, etc.) the teacher will then take the students through the information and explore what happened. In a dilemma case study, students are going to explore in class what happened and what are we going to do about it (i.e. global warming). It is important that when using this method of teaching that the topics are relevant to the students. Not only will it engage the students but it also allows them make meaningful connections. Case studies don't simply have one answer instead there are many possibilities and answers that students can explore.

What makes a good case study? A good case study has a story or set of problems. It is recent and relevant thus grabbing students' attention and interest. Furthermore, a good case study is well researched and includes dialogue. It must be short and general. A case study must allow students to think critically while instilling an educational message. When students don't get a concept, we cannot simply assume that it is their fault. Instead, we must look at our own teaching methods and find new ways to present that information to our students. A survey research laboratory at SUNY/UB found that 97% of students learned new ways to think about an issue through the use of case studies. In addition, it was found that 92% of students were more engaged in classes where case studies were used as opposed to when they are not. Lastly, 68% of students demonstrated in some way that they learned more in classes using case studies.

As a classroom teacher, there are several ways in which the case study method could be used in a classroom. For instance: it can be used in a grade 2 class to study how animals adapt to the changing seasons. The teacher could provide the students with the information and as a class they could explore the topic together. Furthermore, students could brainstorm questions, which they would like to find answers to and do so using a variety of investigative techniques. For instance, as a class they could go on nature walk and observe animals during the changing seasons. In addition, they could read books and watch videos. It is important to note

that the case study method is not limited to science but could be used in other subjects as well, including language arts, math, etc.

Dr. Clyde Freeman Herreid presentation on 'Case Study Teaching' really showed me that the case study method is not something teachers should shy away from. Instead, we should embrace it as it will engage our students and allow them to make meaningful connections. In fact, there are several parallels between a case study and the lesson plans which we create on a daily basis. For instance; both the case study method and a lesson plan look at what teaching method would be used, the material that will be given out, the product students will produce and lastly the assessment method that will be used.

I think this workshop should be presented to teachers in both elementary and secondary schools across the province, as I believe that the case study method would improve students' performance. I would most definitely use this method in my own classroom, as I am confident that I have the necessary skills to establish and execute a case study successfully.

*Primary Junior Pre-service teacher, 2012*

### *Reflection # 3*

I really took a lot from this science workshop and I am definitely going to use case studies in my future classroom. I enjoyed the presentation because Dr. Clyde Freeman Herreid was funny and easy to talk to and was willing to help with any questions that the group had. At the beginning of the workshop, when Herreid ask the group to give our definitions of a case study it surprised me on the different variations of their definitions. It made me realize that case studies can be used for any subject or any field of learning. I really liked how he defined a case study as, "a story with an educational message" because in the end no matter what subject you are using it for it has a message or a problem to solve.

I found it very interesting and informative when he discussed the learning pyramid and the percentages because everyone knows that the lecture type teaching is less effective compared to the other methods such as cooperative learning but to know where the percentages actually derive from was great. You then realize the information came from actual studies and not just random data.

In the workshop, I thought it was fun how the groups were able to participate in an activity using the interrupted case study method about the birds to get the students engaged. I liked this method of case studies because it gives the student initial data to start their thinking process but then it keeps adding information and variable to the problem that will help them come to a conclusion. This allows the students to be constantly thinking throughout the problem solving process. I think that case studies can even be used in primary and junior grades they would just need more guidance from the teacher with the questions and reading material. By allowing the students to

become engaged in a case study that may actually relate to their lives and try to solve it with their peers, I think the students would enjoy learning more and maintain the knowledge better than learning from a textbook or a lecture.

*Primary Junior Pre-service teacher, 2012*

#### *Reflection # 4*

I am really glad that I chose to go to this workshop – many of the concepts they presented/ran through were education, the processes explained, and I can see myself implementing case studies to help better engage and educate my students for long time learning and memory.

I was very surprised at the break down of the retention rates of various teaching methods. I have always known that some teaching methods leave a longer lasting imprint on students education/learning than others but it was a bit of a shock to actually see the numbers. For example demonstration only has 30% which I thought would have been higher as you were giving a visual demonstration of what was being taught. Seeing those numbers and having a discussion on the what and why of it really got me thinking on my own teaching practices. I always felt that hands on learning was the best and try to implement it as often but this only motivates me to ensure I use it as often where I can and add to it by having students show/teach to each other.

I found it really helpful that the presenter listed and described several different case study methods: lecture, discussion methods, small group methods, and individual learning. By approaching case studies with different methods, we as teachers may be able to tackle different learning styles of our students and provide different opportunities for our students – no matter the method the main goal of these case study lessons is for students to gain real learning and retain their learning at a higher rate than some other learning methods. Our presenter then went through one of the methods – interrupted case method. At first I will admit, I was a little angry that he did not give us ALL the information at the beginning. I had thought that if he had given it all from the start we would have been able to solve it faster. However with some thought, I realized that most likely we would not have. By giving us information at different points and interrupting our thought processes, he was forcing us to really think about what we had thought of and not thought of – it changed our thinking process as we realized what information we were missing.

The presenter then went into the part of his presentation of creating a case study. I assumed that creating a case study would be relatively easy – find the objective and then create a story. Not the case. A case study is essentially telling of a story – so what better ways than to start with the story while keeping in mind some of the objectives. To have a successful case study we as teachers need to be aware of several key points – target audience, concept/principles, teaching format, product, and resources.



By using case studies in the classroom, we as teachers will be able to contribute to better retention of information by our students. It is crucial for students to have hands on, relevant learning. Case studies can be made to fit in many different subjects. In the workshop we covered biology/science but depending on the story and the objective, the case studies can be implemented into English lessons, religion, physical education/health, etc.

*Junior Intermediate Pre-service teacher, 2012*

## Online Participant Feedback

Approximately 96% of participants who completed the survey said that they are planning to use case studies in their teaching. Of the participants who completed the survey, approximately 40% were high school teachers (24.53%) or pre-service teachers (15.09%). This is a significant portion of the workshop audience who can bring case studies into Ontario schools to take advantage of this teaching method to help improve students' interest in learning. Many of the pre-service teachers have said that they are already



**Participants taking part in group learning.**

incorporating case studies into their teaching in their practicum placements. The pre-service teachers who attended the workshop can also share the information of case studies with their host teachers during their placement and hopefully their host teachers will incorporate case studies into their teaching as well.

## Recommendations

In a survey of participants, several recommendations were made on how this workshop, or others like it, could be improved. One such recommendation was that more time be spent on explaining and practicing how to actually write a case study. This process was part of the workshop, however some participants felt that it was rushed or that not enough time was allotted it. It is important to note at this point that that this workshop is normally presented in two days in order for participants to have a full understanding of writing and using case studies. This explains why there was not enough time to fully explore the processes.

Participants also expressed a desire for more small group learning. The analysis and work done on the case study as a group was identified as one of the more useful



components of the workshop. It provided teachers with the opportunity to discuss and work with their colleagues while learning about a new style of teaching they could use in their classroom.

A point was raised to include more information about how to initiate and keep students interested in the case studies when working with a large class. The evaluation of large classes was also something that participants would have liked to discuss further. Both of these topics were touched on during the workshop, including the use of clickers in the classroom, but it seems that the teacher would have liked to hear more about it.

Due to some challenges with the video-conferencing, some participants recommended against using it at future workshops. Although it is a good technology when it works properly, it can be distracting when there are problems. In addition, connection problems can cause the participants using the video-conferencing to miss parts of the workshop. Some possible ways to overcome the challenges of this technology were discussed in the previous section of the report.

## **Next Steps**

The next steps in this project includes the dissemination of the workshop information and videos to the participating teachers, institutions, and school boards as well as to anyone else interested in learning about using case studies in the classroom. The information and video will be provided in different forms: as a hard copy sent to the participating post-secondary institutions and to all school boards in Northern Ontario. The case study toolkit will also be disseminated electronically via the Laurentian University School of Education website.

[http://www.laurentian.ca/Laurentian/Home/Departments/School+of+Education+English/Research/CS\\_and\\_PBL\\_Post-Workshop.htm?Laurentian\\_Lang=en-CA](http://www.laurentian.ca/Laurentian/Home/Departments/School+of+Education+English/Research/CS_and_PBL_Post-Workshop.htm?Laurentian_Lang=en-CA)

In the post-workshop survey we asked participants to indicate if they are interested in connecting with other educators who are interested in writing and using case studies. Our next step is to connect interested educators with each other so that they can discuss the use and design of case studies further. This could be accomplished through the creation of a Facebook page for the workshop that interested teacher could join and post comments on. This would allow for quick discussion between educators from all over Ontario.

## **Conclusion**

The Laurentian School of Education would like to thank the Ontario Ministry of Education for providing the financial support through the KNAER grant to enable facilitation of the case studies workshop for educators in Northern Ontario. Dr. Clyde Herreid was a great resource who provided his renowned knowledge on using case studies to teach science and other disciplines. The participants from all educational

levels found the workshops to be very educational and a majority of them are planning to write and use case studies to teach.

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