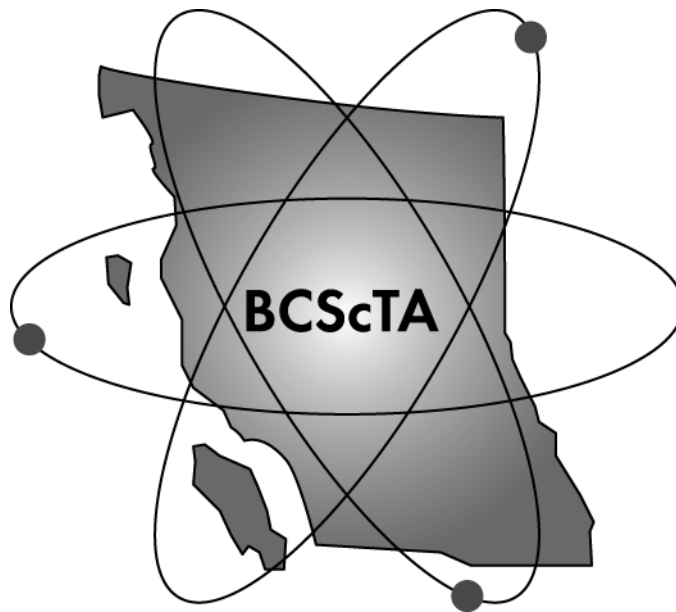


# BC Science Teachers Association



## Science 10 Provincial Final Exam Provincial Survey Results

March, 2009

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## Executive Summary

Two hundred and two (202) current and former secondary school science teachers responded to a web-based survey conducted in the Winter, 2008-2009 by the British Columbia Science Teachers' Association. Three-quarters of the respondents were teaching Science 10 at the time of the survey while all of the remaining respondents have taught this course in the past. The vast majority of the respondents teach in a BC public school; the remaining teach in a BC independent school. Approximately 60% of the respondents have more than 10 years of teaching experience.

Respondents were asked a variety of questions including: What are the effects (both positive and negative) of the Science 10 Provincial Exam on you, the classroom teacher (or on your colleagues)?; and What are the effects (both positive and negative) of the Science 10 Provincial Exam on your students?

The vast majority of respondents indicated that the Science 10 Provincial Final Exam has caused a significant decrease or entire deletion of lab activities in Science 10 classrooms, coupled with a preponderance of direct instruction through lectures. Additionally, Science 10 students now rarely have the opportunity to do group work, research projects and classroom presentations, take field trips to Science facilities or explore local topics or current events due to the stringency of the approximately 100 Prescribed Learning Outcomes and hundreds of scientific terms that students have to memorize for this exam. Respondents repeatedly stated that the science teachers in their schools no longer wish to teach Science 10.

Respondents uniformly stated that Science 10 students are stressed by the heavy load of the curriculum and a final exam that requires them to memorize the meanings of hundreds of scientific terms in addition to the narrow mathematical concepts that accompany the curricular topics. Students with learning disabilities are quickly left behind as the teacher rushes through the curriculum. Respondents report that students express a high level of dissatisfaction with learning Science and appear less interested in enrolling in Grade 11 Science courses such as Physics and Chemistry.

The Ministry Science 10 Integrated Resource Package (IRP) (curriculum guide for teachers) specifies and encourages teachers to recognize that learning requires the active participation of the student; that people learn in a variety of ways and at different rates; and that learning is both an individual and a group process. Almost all respondents reported that the provincial exam prevents these sound pedagogical processes from occurring.

Eighty-five percent of respondents' schools had a school-based Science 10 final examination before the advent of the provincial final exam in 2004. Ninety percent responded that they would again wish to have a school-based Science 10 final examination if the provincial exam was no longer required. Eighty percent of respondents indicated they would support removing the current Science 10 provincial exam and returning to the Ministry's 'assessment for learning' process in the PLAP program. Sixty-six percent of respondents indicated that they feel there has been insufficient support (resources and Professional Development by the Ministry) for the implementation of the new Science 10 curriculum in September 2008.

An examination of the distribution of scores for the Science 10 Provincial Final Examination from 2004-2007 reveals that 18%, 22% and 24% of students failed the exam in each of the first three years with 39%, 45% and 47%, respectively, scoring below 60% in those years. These rates improved in 2007-2008. The failure rates for Science 10 were the highest of the three Grade 10 Provincial Final Examinations for the first three years of administration.

This report includes the following recommendations:

1. The BCScTA recommends that the Science 10 Provincial Final Exam be deleted from the provincial graduation requirements.
2. We further recommend that schools reinstate the development of school-based, teacher-developed Science 10 final exams.
3. The BCScTA further recommends that the Ministry consider redeveloping and implementing the former Provincial Learning Assessment Program (PLAP) that randomly tested students on a wide range of process skills and laboratory skills and provided feedback to individual schools and teachers for the improvement of teaching and learning.

## Introduction

The Ministry of Education introduced provincial final examinations in the 2004 Graduation Program in Language Arts 10, Mathematics 10 (three different mathematics courses), Science 10 and Social Studies 11. A new Science 10 curriculum was adopted provincially in September, 2008 that included new units of instruction (ecosystems, biomes, motion, energy transfer in natural systems, climate change), additional topics within chemistry as well as a continuation of the radioactivity unit. The BC Science Teachers' Association informally surveyed members about the former Science 10 provincial final examination through its listserve in late Fall, 2006. BCScTA conducted a second, formal, web-based survey in winter, 2008-2009. This report provides the statistical results of the web survey along with comments from both surveys.

For over two decades, BC students have scored among the top of the jurisdictions tested in international tests such as the IAEP, IAEP II and TIMSS. The BCScTA therefore believes that student achievement in Science without a Science 10 Provincial Final Examination would continue at a very high level.

## Section 1: On-Line Survey Statistical Results

### Q#1: Which science courses do you currently teach?

Course	% Response	Response Count
Science 8	26.1	52
Science 9	44.7	89
Science 10	87.9	175
Grade 11 Science Courses	71.4	142
Grade 12 Science Courses	61.3	122

### Q#2: When was the last time you taught Science 10?

	% Response	Response Count
I am currently teaching the new Science 10 curriculum.	75.6	149
Not currently, but since the introduction of the Science 10 Provincial Exam	12.2	24
Before the introduction of the Science 10 Provincial Exam	12.2	24

### Q#3: I am based in:

Location	% Response	Response Count
a BC Public School	85.3	168
a BC Independent School	10.7	21
Other (example: school district office, university or college)	2.0	4
I am a retired teacher	2.0	4

**Q#4: If you work in a BC Public School, please indicate your school district:**  
Approximately three-quarters of the school districts in BC are represented.

**Q#5: For how many years have you taught grade 8-12 Science?**

Years	% Response	Response Count
0 to 5 years	19.5	39
6 to 10 years	20.0	40
11 to 15 years	22.5	45
16 to 20 years	15.0	30
More than 20 years	23.0	46

**Q#6: Are you currently a member of the BC Science Teachers' Association?**

Response	% Response	Response Count
Yes	46.5	92
No	53.5	106

**Q#7: What are the effects (both positive and negative) of the Science 10 Provincial Exam on you, the classroom teacher (or on your colleagues)?**  
Please refer to Sections 2 and 3 of this report.

**Q# 8: What are the effects (both positive and negative) of the Science 10 Provincial Exam on your students?**  
Please refer to Sections 2 and 3 of this report.

**Q# 9: Did your school have a teacher/school developed Science 10 Final Exam before the Provincial Exam was implemented?**

Response	% Response	Response Count
Yes	84.6	115
No	15.4	21

**Q# 10: If the Science 10 Provincial Exam were removed, would you want your students to write a teacher/school developed Science 10 final exam?**

Response	% Response	Response Count
Yes	89.8	123
No	10.2	14

**Q# 11: Individual Science 10 teachers or their schools do not currently receive information on which particular concepts their students did not understand on the exam. In the former PLAP (Provincial Learning Assessment Program) assessments, schools did receive results they could use to support their teaching. Would you support removing the current Science 10 provincial exam and returning to the 'assessment for learning' process in the PLAP program?**

Response	% Response	Response Count
Yes	79.8	103
No	20.2	26

**Q# 12: Do you think that there was sufficient support for the implementation of the new Grade 10 Science Curriculum in September 2008?\***

Response	% Response	Response Count
Yes	33.8	45
No	66.2	88

\*Note: Implementation support was provided by the BC Science Teachers Association (through its Catalyst Conference, journal, web site and listserve) and by textbook publishers. The Ministry of Education provided no implementation support or additional directed monies to purchase equipment or classroom resources.

**13. Please make any additional comments that you have on the Grade 10 Science Provincial Exam.**

Eighty-eight respondents answered this question. Please refer to Sections 2 and 3 of this report.

## **Section 2: Summary of Written Comments for Q#7**

***Q#7: What are the effects (both positive and negative) of the Science 10 Provincial Exam on you, the classroom teacher (or on your colleagues)?***

### **Positive Effects**

- Teachers have to teach all topics/PLO's.
- Higher level of intra-teacher communication and discussion in some schools

### **Negative Effects**

- Not enough time
- Too much to teach
- Less or no labs, videos, projects, field trips—the backbone of an interesting science program
- Some topics are beyond Grade 10 understanding
- Duplication of topics in Science 10 and Physics 11/Chemistry 11
- Teachers have limited or no flexibility.
- Teachers cannot deviate from PLOs—no current events or local topics
- Less instructional time available as time is devoted to teaching exam writing skills.
- Unlike in Grade 12, in Grade 10, there are still problems with student absence and students transferring between schools and school districts or arriving new to the province/country. This makes it very difficult for students to complete the topics in the course.
- There are no resource materials for French Immersion classrooms.
- BC is behind other provinces (particularly Ontario) in developing new Science curricula.

## **Section 3: Summary of Written Comments for \*#8**

**Q# 8: What are the effects (both positive and negative) of the Science 10 Provincial Exam on your students?**

### **Positive Effects**

- If students are successful, they feel like they have achieved something by doing well on an exam.
- Streams students before they reach the senior sciences.
- It forces them to review all material from the beginning of the course. But, former school-based exams did exactly the same thing.

### **Negative Effects**

- Leaves slower students behind due to the need to push ahead to complete all topics and still have time to prepare for writing a provincial exam.
- Slower students and ESL students struggle with the very high vocabulary demands.
- Lower student interest in senior science courses; Students do not like science anymore.
- Grade 10 students are not mature enough to be rigorous in work habits.
- Unlike in Grade 12, in Grade 10, there are still problems with student absence and students transferring between schools and school districts or arriving new to the province/country. This makes it very difficult for students to complete the topics in the course.
- This is a 'one size fits all' course and exam, unlike Math 10 that has three separate courses for more capable and less capable students. The pressure on less-able students and students in special programs is tremendous; many simply give up. This is unfair to these students.
- Miss out on science literacy work (a focus of the Pan-Canadian Science Curriculum).
- A wide range of material is covered with insufficient time to steep in any of it, which results a lower likelihood of students retaining the information.
- Destroys some students self confidence and being overwhelmed
- Students must memorize lots of trivial facts
- Science has become a reading and textbook course compared to hands on
- There is no credit on the multiple-choice exam for part marks on process questions due to all multiple choice. That is counter to the way that Math teachers teach students (ie partial credit for showing work). So, students get lower marks although they actually do partly understand.
- Slower students cannot do the Math required.
- The exam narrows discussion, curtails exploration and forces unrealistic expectations upon many students. It is a huge source of stress for many of them, and in many cases, all but guarantees failure and/or a negative final Science 10 experience.
- Students of lower ability are likely to have to take Science 10 two or three years in a row, and will miss out on other educational opportunities.
- Marginal students are very discouraged after the exam.
- Students spend more time taking notes, trying to remember information rather than skills
- Students must prepare themselves to take a government "final" exam. Students are pressured to take the course seriously, but most do not.

## **Section 4**

### **A COMPARISON OF STUDENT GRADES ON THE SCIENCE 10 PROVINCIAL FINAL EXAMINATIONS, 2004-2007**

#### **Science 10**

The following table shows the percentage of students who received grades A through F on the Science 10 Provincial Final Examination (all sessions) from 2004 through 2008.

	F		C-		C		C+		B		A	
	#	%	#	%	#	%	#	%	#	%	#	%
04/05	7938	18	9311	21	6903	15	6693	15	9312	21	4823	11
05/06	10841	22	11565	23	7481	15	6870	14	8939	18	4603	9
06/07	12301	24	12071	23	7471	14	6583	13	8425	16	4776	9
07/08	6170	12	9014	17	11824	23	9294	18	8526	16	6961	13

## **Section 5: Samples of Written Comments**

**Q# 8: What are the effects (both positive and negative) of the Science 10 Provincial Exam on you, the classroom teacher (or on your colleagues)?**

### **Sample Comments**

**Lack of desire to teach Science 10.** It used to be my favourite junior science as it gave me the best opportunity to develop an understanding of the scientific process across the broadest spectrum of science knowledge.

**It limits my flexibility, i.e. I must teach to the exam,** rather than being able to adapt the curriculum to students in my area.

**On the positive side,** it sets a standard that students must reach province-wide. However, it is questionable whether the exam tests the knowledge and skills the students have learned. I feel forced to teach to the test -- it is a race to finish the course and a lot of the time it seems the only one who does finish successfully is the teacher!

**Pressure to cover content in time and prepare for exam** makes teachers accountable but far less freedom for teacher.

**I have significantly reduced the number of labs/activities so I can cover content for exam.**

**I have heard that some teachers have copies of previous exams. I don't. This is unfair for students.**

**Our teachers prefer to teach other science courses (Sc 10 is their last choice).**

**The Prov. Exam creates a restriction on time, variety of content and depth of learning available for the kids. I cannot do hands on labs as there is not time.**

**I cannot spend extra time on a topic if the interest is there.**

**Positive effects** are that it holds us accountable as teachers both to each other and to the students. **Negative effects** are that it restricts my freedom to teach the material at a pace that allows each student to be successful.

**The focus on content and facts over the ideas of exploration and scientific method make the teaching of junior science a lot less fun to teach than it should be.** Junior science should be fun and engaging and if the teacher has to focus on content there is little time to really explore.

**Pressure to cover the entire curriculum leads to incredible time pressure. Topics are then addressed so quickly that there is little opportunity to explore areas of further interest.**

**While the exam is supposed to assess the overall knowledge of students, I feel that too much emphasis is placed on an exam that may not really allow true assessment of the students' knowledge.**

**It creates too much pressure for the teacher to cover material at the expense of labs, activities, videos and fieldtrips.**

**The provincial exam limits the amount of time I feel I can dedicate to critical thinking activities, and developing more meaningful learning strategies.**

**Teachers will cover entire curriculum - teaching to the test - less time for labs/field trips because I must get through all the content of the course - less time for projects or to dig deeper into a topic.**

A lot of time-stress and extra exam prep sessions to ensure that all students, particularly the boys, will actually review for the provincial exam. It takes me away from my Grade 12 students at a critical time of year for them.

**My students have not had the experience that they should have in a science course.**

The curriculum in the new Science 10 is **difficult for the average student** to completely understand. **It is also turning students off of Chemistry in grades 11 and 12 because of the unnecessary difficulty in Science 10.**

**I think that this has made the teaching of grade 10 much better as students are exposed to all fields in the course, not just the teacher's pet area!**

**The overall effect of the Provincial Exam is negative. I feel that I spend too much time worrying about the exam and not enough time focusing on how to best teach.**

In a small, rural school, I need to be flexible in classes of mixed grades. The provincial exam **makes my teaching more rigid, and less based on the needs and interests of my students.**

**Positive : collaboration with colleagues in planning    Negative: teaching to the lowest only surface level coverage of material .**

**Positive:** forcing collaboration with colleagues ensure science specialists teach course. **Negative:** limiting student interest and engagement due to less time for labs; superficially teaching; forced to teach brief ideas as opposed to really get into depth; way less experiential learning and labs; way too much focus on reading and written, less focus on science concepts

**Teaching to the exam**, leaving out rich material and current events, fewer labs, constantly apologizing for no time for labs, no projects (have to practice for the gov't exam).

**Positive:** The exam has stimulated discussion with colleagues regarding the validity of exams. **Negative:** I have very little time to teach process and science skill. Too much time is spent on straight facts, vocabulary that students quickly forget and needless content that may be on the exam. Junior Science has become a negative experience for a lot of students. I just have to keep on pushing in order to cover the outcomes of the exam. I have nothing in the way of positive feedback regarding the exam.

Removes time to do hands-on science, spending more time trying to cram knowledge for an exam to get through all the material

**Good curriculum with good text but too much information for effective learning. Too much curriculum and final exam should be done away with!!**

**Rush through curriculum. Try to guess at what the content of "some" of the exam questions will be (in terms of interpreting learning outcomes).** Frustrating to only have two practice exams available. Frustrating to have so much vocabulary.

**Rushing through the course to complete all learning outcomes.** Focusing on covering all outcomes superficially, rather than going more deeply into topics that students are interested in. **Less lab time, less opportunity to stop and spend more time on areas that kids are excited about.**

**Negative effect in that there is little to no information that results from the exam that I can use to improve the next year's teaching.** It would be helpful if there was a breakdown ( percentiles ) for each student/ class referenced to the PLO's that wa sent to each teacher.

**It makes for a sense of accountability for sure; is that appropriate for Grade 10?**

The Science 10 Final Exam is always on our minds. There is too much material to "cover" for the exam. **It is more difficult to motivate students in curriculum topics.**

**I feel like the need to cover every aspect of the PLO's in preparation for the exam puts me under extreme time constraints.**

**I am very frustrated with the rate at which I have to 'cover' material. I am leaving students behind if they don't understand, as there is no time to slow down.**

**Positive** - I am forced to get through the entire curriculum in 10 months **Negative** - I know some of the students are barely keeping up, and I just have to keep moving them through because the curriculum is overloaded

**Keeps teachers consistent with teaching the prescribed learning outcomes but gives less time to expand on areas of interest to students.**

**I must admit that it does put a fine point on the Learning Outcomes and forces me (and all Science teachers I assume) to ensure that they cover all outcomes to an appropriate depth. However, I find the curriculum almost impossible to cover to that depth in the time given, making the Exam a source of stress.**

**It becomes a matter of "flying" through the course material.** Unfortunately it becomes difficult to do many extra activities or projects that would enrich student learning as a result of needing to maintain a fast pace to cover all topics.

**There is no time to revisit any topics.**

**I am forced to teach concepts too quickly in order to cover all of the curriculum.** The course loses its depth/opportunities for interest and curiosity and students lose interest. Students get discouraged at how much material there is to cover.

**Negative** - **I have to cover a course that is overloaded and developmentally ill-conceived.** The course has outcomes that are frequently flawed and cannot be understood by the clients - the students.

**The pressure of the exam** encourages a broad and shallow content delivery, and makes it very difficult to adapt the course to the interests/needs/abilities of the students.

**A rigorous curriculum regardless of the class make up. Quite standardized instruction from class to class.**

**Negative:** - the desire of the teacher to adequately prepare students for the exam has lead to a dramatic reduction in the number of lab-based inquiry activities and is producing science students who do not understand proper laboratory procedures as they enter Grade 11 Science courses.

**There is much less time for lab work, research projects, experiential learning.** To complete the course we have to focus entirely on the textbook. I spend time on test writing technique, and I take the time away from other science instruction.

**Less flexibility and scope in the curriculum to pursue interests and strengths for the learner and the teacher.**

**There is so much content with an overwhelming amount of vocabulary for students to learn.** I don't think a multiple choice test adequate addresses the learning that takes place in my class, although it is a quick grading format.

**The exam forces me to rush through more content, and teach in a way that focuses on memory and rote learning.**

## Section 6: Samples of Written Comments

**Q# 9: What are the effects (both positive and negative) of the Science 10 Provincial Exam on your students?**

### **Sample Comments**

**Pressure** to cram the material in rather than interest in understanding the material seems to be the main motivator.

It does not fairly evaluate the skills and knowledge the students have learned, and therefore negatively affects their self-esteem. **For instance, students with language difficulties or learning disabilities are not well evaluated by this exam.**

**My current students are VERY low ability** and there is no way they'll pass a Provincial. I'll add that the difficulty getting kids assessed and on official IEP's is adding to the issue.

**Grade 10 is too young to write an exam like this.**

**The majority of Grade 10 students do not seem mature enough** to take seriously a high-stakes standardized exam

**Almost impossible for any kids with learning disabilities to understand**, keep up or write tests...

**Kids miss the labs and they dislike moving so fast through content!!**

**I feel it takes focus away from what junior science should be about, science process.**

**Weaker students struggle or give up.**

In some respect, the exam is good training for students on an academic program, planning to go on to post-secondary education. However, **most grade 10 students lack the maturity** to approach the exam in a serious manner.

Even though it is only worth 20%, **students are very stressed** and become interested in marks and not much interested in learning and developing a knowledge of science.

If a student does not understand the material teachers are limited in how much time one spends to reteach or supplement concepts, this causes student anxiety to increase.

**Grade 10 should be about invoking a sense of enthusiasm for science** as well as promoting a hands on approach not a test

**Students become overly concerned about taking the test and suffer severe test anxiety.**

**They place more importance on the exam rather than topics they find most interesting.**

**The student response to the exam has mostly been negative.**

Positive: helps them see learning as cumulative. Negative: **overemphasises assessment to learning**; discourages independent investigation.

**Students miss out on some science literacy work.**

**Science should be an opportunity for awe and excitement but the exam turns science into a daunting slog.**

**Positive: It exposes the students** to a high stress exam (although not high stakes) that starts the preparation for university for those who will choose to go to university.

Our feeder schools are all **Grade 7-9 middle schools**. The Grade 10s who enter our school are a product of an educational system that ill prepares the student for any type of provincial exam.

High-risk students don't have the reading level or comprehension to be successful on the exam as it is written at a very high level.

**Weaker students are being left behind, middling students are tiring of factoid based science.**

**Many students (usually the ones who need to prepare the most) feel overwhelmed.**

The provincial exam causes stress among Science 10 students. They perceive the test as the ultimate gauge of their learning for the course. **Many are unable to see** that the entire process constitutes their learning experience.

**We teach students who were not successful** at a large school, but thrive in a small, structured setting. They believe they will never pass, so why study only to fail?

**ESL students and weak readers tend to be slaughtered by the formal language.**

Increases the fear factor of failure.

Science 10 should be laboratory-oriented. Exams should be school-based or district-based.

The multiple-choice nature of the exam **does a disservice to students** as it does not adequately prepare them for the types of final exams they will be facing in the senior grades or in university.

The learning is more superficial now, because the high volume of material allows for less inquiry, **less discovery based learning**. The students are less familiar with science related techniques and equipment now because so much of the course is knowledge based

They look for **tutors**, and **exam study guides** and look up and print off all the sample exams and answer keys from the ministry website. **They question** the value of any work they see as not being on the exam.

Students are overwhelmed with the **amount of vocabulary**.

**It ensures** that all the students have learned the core curriculum.

Forces them to become rote memorization machines and **denies them the opportunity** to develop their lateral and critical thinking skills.

## **Section 7: Samples of Written Comments Q #11 and 12**

***Q# 11: Individual Science 10 teachers or their schools do not currently receive information on which particular concepts their students did not understand on the exam. In the former PLAP (Provincial Learning Assessment Program) assessments, schools did receive results they could use to support their teaching. Would you support removing the current Science 10 provincial exam and returning to the 'assessment for learning' process in the PLAP program?***

I would find feedback on concepts that student had difficulty on so much more worthwhile than what occurs now. It seems really silly to me that the test is administered in order to assess how Science 10 students are doing and yet there is no data given to teachers to help their students do better the next time around.

I think it is essential that the ministry provide us with a breakdown of the concepts with which students had difficulty. The exams should be released after use rather than being kept secure, so that teachers can have better familiarity with the types of questions the province puts to the students.

Feedback would be good.

Improve feedback on the provincial exam, or return to the PLAP program.

Teaching to this test is absolutely pointless. The whole course just felt like a race to the finish before the buzzer goes off! Let's return to the former type of random assessment.

I would support anything that removes the current style of provincial exam.

If there is an assessment, of any sort, teachers should be able to use it to develop their practice, and the only way to do that is to know what areas students do well on and not so well on. If this info isn't provided, then the exam becomes even more questionable.

I am unable to change my practice and improve in my teaching if I am unaware of the specific areas that my students are struggling with.

If students no longer have to write provincial exams in Grade 12, why are we making them do it in Grade 10? It's not practice, and it's not useful to anyone.

I am in favour of assessment that helps me know how to do my job better. I am also in favour of assessment that is fair to students.

Absolutely! With the demise of Grade 12 provincial exams (except English), what is the point?

With the current provincial exam, there are way too many unknowns and teachers are unable to improve the course.

Absolutely! That way the test would be more meaningful and teachers could work to improve their practice in areas where students needed more help.

This type of assessment would be more helpful in so many ways.

I support randomized standardized testing of Grade 10 students if the province wants to assess student abilities at a specific Grade level.

An external measure of the learning does not bother me, and more useful feedback would be helpful,

I would like to receive information back on my student's achievement in the various strands.

## **Section 8: continued: Summary of Written Comments**

***Q#12: Do you think that there was sufficient support for the implementation of the new Grade 10 Science Curriculum in September 2008?***

No funding was provided for new materials, lab equipment, or AV aids.

Good support through textbook companies.

There is an entire 10 page list of resources suggested for the BC Science 10 textbook but our school did not have the budget to get the resources.

What was the rationale for change? - No new money was available for new supplies, equipment, or Learning Resources for a mandated new course - No new money was available for teacher training. BCScTA has provided some awareness and conferences - thank you

The textbook publishers have provided great support but there has been very little support from the government itself. Providing two sample exams is not considered "support".

I don't believe there was any support at all for the implementation.

The support we had was from the textbook company that our board selected. No other support was provided.

Thankfully, McGraw Hill had some support and put a lot of work into understanding the new curriculum, but had we not bought those textbooks and the company's resources, I would feel very much at a loss.

From the Ministry it was weak; from the BC Science 10 textbook suppliers, the support was fantastic.

I feel the Ministry should also be providing teachers with more resources related to the provincial in order for students to be better prepared for it.

Minimal pro-d offered, most from the publisher of the textbook. Time should be given for teachers to meet to discuss new topics.

This work has been left to the textbook companies really; there has been very little support for implementing new topics.

There was not enough provincially available resources.

Zero implementation except from publishers.

Extra monies were not made available to provide for new curriculum materials and texts.

We received next to nothing, no time, no explanation other than the PLO's.

Far more input from trained and experienced teachers that are in the trenches teaching the courses to the students of today should have been done.

The BC Science 10 text (McGraw-Hill) had lots of resources. Again, they suggested excellent activities/labs but we had no time to complete them!

The textbook and workbook including online resources were helpful implementing the new course.

Not enough funds were available to purchase new textbooks, lab equipment and supplies.

There was none. We received no in-service until a November 1/2 day Pro-D day organised locally. There was no money for new equipment or supplies.

The text I used and their support is phenomenal. The Ministry provided next to nothing.

Many teachers have to teach units outside their background and in the process relying on flawed resources that were thrown together to quickly and not piloted. Heck, even the curriculum was not piloted

There were numerous attempts by the district science curriculum coordinator to offer after-school pro-d in the spring and fall of 2008, but the only support that was really useful I received in the summer from the BC Science 10 and Science Probe 10 websites available with the purchase of the teacher's guide

Mostly, there was insufficient support in the development of a decent curriculum.

Our district did a great job with support. The Ministry should have taken some initiative as our district did and helped to organize and fund implementation programs.

In previous years, there was an optional implementation year that allowed for the development of materials and approaches to new topics but not this time.

When the province decides to bring in a new curriculum there should be extra funding for textbooks and professional development. Teachers must be supported.

No workshops, little time for collaboration, no extra money for resources (including fieldtrips for rural schools). The implementation was unprecedented. All other new curricula have had transitional periods.

This was dumped on us with no opportunity to pilot and provide feedback on depth and amount of material we were expected to cover.

The BC Science publisher (Mr. L. Sanders at Edvantage Press) has done an outstanding job of providing support. From the Ministry, nothing.

The physics and biology topics were so drastically changed, that non-physics and non-biology teachers probably have struggled with the new content and how to present it.

## **Section 9: Samples of 'Additional Comments' Received**

If we must keep the current curriculum, lets get rid of the exam so I can adapt the course to where my kids are. Provincial exams cause needless stress and keep kids from experiencing success.

I think Grade 12 government exams are more beneficial because we are trying to prep students for the style and feel of university type exams. I think students get a taste of that with the government exams....but at the grade 10 level? Since no information is being shared with teachers- except what the grades are- that is does not help out the students or the teachers to become better learners.

I think the exam is useful and has its place to ensure accountability and order but the content needs to reflect average student ability and need. Splitting Science 10 into two groups (lower and higher levels or academic versus non-academic) would go far in alleviating this problem.

On one hand, I welcome the idea that some measure is in place, which can counter the current pressure I sense to reduce expectations of students. Use of this information by outside organizations to rate schools, while unpalatable, does not affect my job in any real way. I might feel differently if I were at a school with a lower socio-economic status student population. The exam is of no real use for me in my practice, as I don't know which concepts my students did well on, and which were difficult. I'm not sure that grouping that data would be useful either. A per-student breakdown would allow me to put the information into a broader context. E.g. "Johnny was in Mexico during the two weeks we spent on that group of concepts."

Past exams appeared to be written for the high achieving A students. The average student seemed to come out of the exam deflated and feeling that although they may have passed the course, they certainly failed the exam or did not score as well as they thought they should have. This tends to turn students off of science, which is not in the best interest of anyone.

I think if we believe in assessing students in different ways, and that learning occurs at different rates then we need to reconsider why we have provincials, as provincials are one method of assessment and by nature of having one a teacher has to teach the course at a set rate. Also we need to consider the rationale for a grade 10 exam when at the senior levels we are moving away from them. Why do we have them at grade 10; is it to prove that the outcomes are covered? I don't think this is a good reason to have one as it does not address the higher purpose of science education.

I think the assessment would be more valuable if it assesses more than just multiple choice questions. A free response section would be welcomed, if the exam is continued, but I'd rather not have a provincial exam at all.

As with grade 12 program if the grade 12 exams are optional why are the grade 10 exams mandatory. Is the data more realistic from students just beginning to mature intellectually in grade 10 semester one versus grade 12 students who have three years of academic development in a linear timetable system. How can schools be compared with different elective programs that provide more instructional time to core academic courses.

It would have a negative effect on teaching and learning if the provincial exam was removed!

Science may need to be taught in two different levels if there continues to be a provincial exam. Math ability determines the student success in the Physics section in particular. The exam is too print heavy.

If Science 10 remains a content-heavy course, consider streaming it.

Get rid of it! We are losing kids from Science because of it!

I would support anything that removes this exam from Science 10.

It is ridiculous that when final provincial exams are experimentally shown to not be good indicators of later student success at the university level that the exams, with all of their attendant expense and anxiety, continue unabated. This would be even more so for Grade 10 exams.

This exam is not necessary; students quickly forget what we crammed into them.

Why take a hands on science course and turn it into a book learning, paper-based course so over filled with curriculum that no topic can be expanded on? Terrible course now!

It is a costly, time-consuming process that provides some useful but limited measures.

Too much time spent on the mountains of curriculum for the 20% final exam to the point where labs and activities are removed to accomplish this. We need to return to the old system of school based final exams!!

I'm sure it provides a useful benchmark and allows us to obtain some interesting statistics...BUT... it does turn off students to science when they're at an age we should be inspiring them. It also encourages a style of teaching that is very fact-based, and that discourages more reflective, more general study of science as a PROCESS, not simply a body of knowledge.

The provincial exams have destroyed an excellent science course and, now, in our school the best prepared, best trained, best experienced teachers are choosing not to teach Science 10.

If the provincial government has made all Grade 12 provincial exams (except for English 12) optional, then I am not sure for the rationale of a mandatory Grade 10 exam.

The curriculum is so prescribed that it has taken away the advantages that any teachers specific skill group might have added.

I have seen much data that these types of exams just measure short term recall but nothing to show how they facilitate the development of long term learning, the type of learning that one can use as at least a base level of understanding for decisions that the students might need to make as adults.

Not useful to improve learning in my classroom. We are covering a kilometre of curriculum a cm deep.

There are so many opportunities to 'hook' the students, but because of the pressure of the final exam, you don't have the luxury of spending an extra class or two on a topic that has the class completely interested and turned on to science.

ESL and special needs students are at a complete disadvantage when taking the exam. Really, shouldn't we be teaching the skills how to learn, not simply what to learn?

What is the real and explicit purpose of such an exam at such an early age for students?

An exam that consists solely of multiple-choice responses is easy to mark, but makes for a poor assessment tool.

We have pressure in our school to ensure that our students' course marks are at least 5% higher than their provincial exam marks.

I have always wondered about why we need to have exams like these for students in Grade 10. The process has a significant price tag, but I don't quite see what we gain from it.

I am in support of the provincial exam however I do find the scope of the course so great that many students struggle to learn even a portion of it. It is a shame that we have no time to really get into each unit due to this loading.

## **APPENDIX 1**

### **Statements from the Science 8-10 IRP (1996)**

The following IRP statements suggest a broad, student-focused curriculum. Other philosophical and pedagogical statements from the IRP could be added to these. The Science 10 provincial exam does not allow for such a curriculum to be taught in Science 10. Compare these statements with the views expressed by teachers earlier in this report. **Similar contradictory statements are found in the draft Science 8-10 IRP (June, 2006).**

#### **Page 5: Suggested Instructional Strategies**

Instruction involves the use of techniques, activities, and methods that can be employed to meet diverse student needs and to deliver the prescribed curriculum.

#### **Page 5: Suggested Assessment Strategies**

The assessment strategies suggest a variety of ways to gather information about student performance. Some assessment strategies relate to specific activities; others are general.

**Page 8:** This Integrated Resource Package sets out the provincially prescribed curriculum for Science 8 to 10. The development of this Integrated Resource Package has been guided by the principles of learning:

- Learning requires the active participation of the student.
- People learn in a variety of ways and at different rates.
- Learning is both an individual and a group process.

#### **Page 8: RATIONALE**

The science curriculum of British Columbia provides a foundation for the scientific literacy of citizens, for the development of a highly skilled and adaptable work force, and for the development of new technologies. It is a foundation on which teachers can develop a science program that provides a comprehensive set of knowledge, skills, and experiences related to science.

#### **Page 8: RATIONALE**

School science programs that are planned to develop scientifically literate students provide experiences that:

- help students become flexible and adaptable rather than focussing on acquiring specialized knowledge

- develop the capacity to think critically
- call for a wide range of knowledge, methods, and approaches that enable students to analyse personal and societal issues critically
- encourage students to examine the impact of scientific knowledge on their lives, society, and the environment
- develop a positive attitude toward science
- cultivate students' appreciation of the scientific endeavour and their potential to contribute to it

The Science 8 to 10 curriculum emphasizes how science and its related skills are used in everyday life and the workplace. To prepare students for further education and for their adult lives, the provincial science curriculum engages students in the investigation of scientific questions and the development of plausible solutions. Science education develops and builds on students' sense of wonder about the world around them and encourages a feeling of responsibility to sustain it.

## **APPENDIX 2: Excerpts from Two Reports on Assessment**

### **Students look for a lower level of understanding when studying for multiple choice exams.**

As it turns out, "good enough" is precisely what multiple-choice exams are all about. . . . By restricting the answers to certain possibilities, multiple-choice questions provide a circumscribed realm of information, where subtle clues in both the question and the few answers allow shrewd test takers to make helpful associations and rule out certain answers (for decades, test-preparation companies like Kaplan Inc. have made a good living teaching students that trick). The "gaming" of a question can occur even when the test taker doesn't know the correct answer and is not entirely familiar with the subject matter.

... multiple-choice tests not only torment students; they also feature centrally in the increasingly vitriolic debate over standardized testing. Do they adequately measure student learning? Do they simply force teachers to "teach to the test"?

Daniel J. Cohen and Roy Rosenzweig. No Computer Left Behind. *Chronicle of Higher Education*, Feb. 24, 2006. <http://chnm.gmu.edu/resources/essays/essay.php?id=38>

### **What the Research Says**

Evaluations of student progress based on a variety of assessments are more accurate than evaluations based on a single exam. Classroom assessment is both more reliable and more likely to improve student achievement.

**Research has shown that large-scale testing can have negative effects on student motivation and learning, and that those effects are greatest for low-achieving students, the ones who most need support. Common negative effects of provincial exams include:**

- narrowing of instruction and instructional methods
- students inappropriately focussed on short-term performance goals "What's on the test?"
- test anxiety
- students, parents, and others inappropriately generalizing test results to overall "value" or "intelligence"
- less successful students concluding they are unable to succeed, reducing effort.

(Wynne Harlen and Ruth Deakin Crick (2002). *Review: What is the evidence of the impact of summative assessment and tests on students' motivation for learning?* Presentation, International Conference, Assessment Reform Group, March 5, 2002.)

## **Appendix 3**

### **Reflections on Intents of the Common Framework of Science Learning Outcomes K To 12 (Council of Ministers of Education of Canada, 1997) (the 'Pan-Canadian Science Project on which the BC IRP (2006) is based) and from Science 8-10 IRPs in British Columbia**

*The following are selected intents from the 1997 Pan-Canadian Science Project for which British Columbia was the lead province for the Anglophone section. These statements strongly argue for a broad-based Science 8-10 curriculum, a curriculum that is unattainable in an atmosphere in which students are subject to a provincial exam.*

**The Common Framework of Science Learning Outcomes K To 12** (Council of Ministers of Education, 1997) describes a vision of scientific literacy by which students “acquire science-related skills, knowledge and attitudes.” These three components, coupled with a fourth component, critical thinking skills, had formed the basis of the massive K-12 science education revision of the mid-1980s in British Columbia. BC’s program, at the forefront of education innovation, The program recommended the use of innovative teaching strategies, a wide variety of classroom activities, a comprehensive bank of evaluation procedures and an emphasis on “the application of science and technology in the solution of practical problems and the clarification of issues” that face Canada and the world.

#### **BC IRPs reflect the 'Pan-Canadian' Philosophy Past and Present**

The current set of Integrated Resource Packages (IRPs) was intended to be a refinement of the process begun in the mid-1980s. The 1996 IRP for Science 8 To 10 describes a wide variety of instructional strategies “to meet the diverse student needs.” “Evaluation, reporting and student placement ... depend on the professional judgement of teachers.” School science programs, according to the IRPs, are intended to “help students become flexible and adaptable rather than focussing on acquiring specialized knowledge.” Students were to acquire knowledge so that they could “analyse personal and societal issues critically” and “examine the impact of scientific knowledge on their lives, society and the environment.” Significantly, as was intended with the science curriculum revisions of the 1980s, the program was to provide students with experiences that would encourage them to “develop a positive attitude toward science” and “cultivate students’ appreciation of the scientific endeavour and their potential to contribute to it.”

How successful were these revised programs in meeting these goals? If the yardstick of British Columbia’s performance on international and national science assessments is applied, all seem to be in agreement that the goals of the revision were accomplished. British Columbia’s standing in the International Assessment of the Education Program (IAEP II), the Third International Mathematics and Science Study (TIMSS) ([www.curricstudies.educ.ubc.ca/wprojects/TIMSS](http://www.curricstudies.educ.ubc.ca/wprojects/TIMSS)) and other assessments has been consistently higher than other national and international jurisdictions.

From the TIMSS-99 Press Release, December 5, 2000, it was reported that Canada is one of only two countries in which students showed significant improvement in both mathematics and science. In Science, only nine of the other forty-nine participating countries scored above Canada. One provincial report stated: “We still have some distance to go to be at the level of countries such as Japan, Korea, Singapore and the western provinces of Alberta and British Columbia.” Canadian students performed better than the international average in four of the five science content areas: earth science; life science; physics; and the environment and the nature of science. The Canadian result in chemistry was the same as the international average.

The Vancouver Sun headlined their report of June 3, 2000 with “B.C. students shine in national science test.” Sun Reporter Janet Steffenhagen quoted the Minister of education:

**“This assessment shows B.C. students can compete academically with their peers at a national level.”**

We can therefore see that a comprehensive plan over the past twenty years has produced major shifts in the methods by which science education has been approached and taught in British Columbia. International evaluations have validated these changes. In spite of the populist tendencies to criticize schools, school teachers, school programs and even the Ministry of Education, we have seen, in fact, that our science students continue to lead the world in their understanding and application of scientific concepts and principles.

For further reading

“B.C. students shine in national science test”. The Vancouver Sun. Saturday, June 3, 2000

The Common Framework of Science Learning Outcomes K To 12 (Council of Ministers of Education). Pan-Canadian Protocol for Collaboration on School Curriculum. 1997

BC Ministry of Education. Science 8 To 10 Integrated Resource Package. 1996

BC Ministry of Education. Junior Secondary Science Curriculum Guide and Resource Book. 1983

## **Appendix 4**

EXCERPTS FROM: THE ROSE STUDY

### **The Relevance of Science Education Project (ROSE) in England: a summary of findings**

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**Table 7.1: Students' responses (percentage in each category) to statements  
about the science they may have had in school.**

	disagree	low disagree	low agree	agree
	%	%	%	%
1. School science is a difficult subject	24.1	33.7	27.5	13.6
2. School science is interesting	15.9	23.0	38.1	23.1
3. School science is rather easy for me to learn	20.3	37.1	31.1	11.4

For those concerned about the future well-being of science itself, perhaps the most disappointing data in Table 7.1 relate to the final three statements. Some of the mean scores here, for both boys and girls, are among the lowest registered in response to this section of the questionnaire. A career in science has little appeal for either boys or girls and the prospect of having 'as much science as possible at school' is not attractive to either. A 'job in technology' has more appeal for boys than girls but, even here, the mean score falls below the 'neutral' position of 2.5.