



THE STATE EDUCATION DEPARTMENT / THE UNIVERSITY OF THE STATE OF NEW YORK / ALBANY,
NY 12234

TO: P-12 Education Committee

FROM: John B. King, Jr.

SUBJECT: Part 100 Regulations of the Commissioner of Education,
relating to the laboratory requirement for qualifying to take
a Regents examination in any of the sciences

DATE: April 22, 2011

AUTHORIZATION(S):

SUMMARY

Issue(s) for Discussion

What review process does the Board of Regents want to initiate pertaining to the laboratory requirement pursuant to clause 100.5(b)(7)(iv)(d) of Part 100 of the Regulations of the Commissioner of Education?

What changes should be considered to amend this Part 100 regulation pertaining to the laboratory requirement to reflect the advancements in science, developments of new technologies, and current research on science education (teaching and learning) and cognitive science that will better prepare learners for the demands of citizenry, college and careers?

Reason(s) for Consideration

Implementation of Policy.

Proposed Handling

This question will come before the P-12 Education Committee for discussion in May 2011.

Background Information

According to this regulation, in order to qualify to take a Regents examination in any of the sciences, a student must complete 1,200 minutes of actual hands-on (not simulated) laboratory experience with satisfactory documented laboratory reports. The 1,200 minutes of laboratory experience must be in addition to the required classroom instruction associated with earning a unit of credit.

The laboratory requirement is satisfied by completing a minimum number of minutes of actual hands-on laboratory experiences with documented satisfactory reports. Local school districts have the responsibility to develop and implement comprehensive laboratory activities and experiences and to determine what constitutes a satisfactory laboratory report. These components of the laboratory requirement, however, are not necessarily correlated with a statewide model of quality instruction and mastery of the New York State (NYS) Learning Standards. Courses that culminate in the Regents Examination in Living Environment must incorporate four required laboratory activities developed by the Department. Courses that culminate in the Regents Examination in Physical Setting/Earth Science should incorporate laboratory activities that address the performance component (hands-on) included as a part of the examination.

At the October and December 2010 and the March 2011 meetings of the Board of Regents, the College and Career Readiness Working Group considered potential revisions to high school graduation requirements, in terms of their effectiveness and their ability to maximize all students' educational potential, and as a signal to higher education institutions and employers that New York's high school graduates must be college- and career-ready. These potential revisions include increasing the number of units of credit in science for graduation from 3 credits to 4 credits.

Many colleges and universities in New York and in other states require students to earn at least 2 or 3 units of credit in science as a result of successful completion of high school science courses that include required laboratory experiences. According to the current Part 100 Regulations, high school students must earn 3 units of credit in science (at least one unit in physical science, at least one unit in life science, and one in either physical science or life science) and take and pass one Regents examination in any of the four sciences (Living Environment, Physical Setting/Earth Science, Physical Setting/Chemistry, Physical Setting/Physics). In order to qualify to take any of the four Regents examinations in science, a student must complete the laboratory requirement. High school students in New York today can satisfy diploma requirements in science and still not meet the minimum admissions requirements for science in many colleges and universities, because they only need to earn one unit of course credit (one science course) that includes the laboratory requirement.

At the January 2011 meeting, the Board of Regents adopted NYS P-12 Common Core State Standards for English Language Arts & Literacy and Mathematics, and approved the new Pre-kindergarten Learning Standards. The Common Core Standards were the product of collaboration across 48 states and 3 territories to develop a common understanding of the knowledge and skills in English Language Arts & Literacy and Mathematics required for college and career readiness. A similar effort is underway in Science. A Framework for Science Education, developed by the National Academies' Board on Science Education, is under a revision process. Once published, this Framework will be the foundation upon which the Next Generation Science Standards will be developed by a coalition of states in collaboration with Achieve, Inc. and completion is anticipated in late 2011.

Recent changes and proposed additions to Commissioner's Regulations allow students to demonstrate achievement of the NYS Learning Standards through alternate pathways beyond traditional coursework. Regardless of the pathway followed to earn a unit of credit, all students must satisfy the laboratory requirement as addressed in clause 100.5(b)(7)(iv)(d) of the Commissioner's Regulations to qualify to take a Regents examination in any of the sciences. For example, students can participate in online and blended learning under certain circumstances, including:

1. participation in a district-approved independent study course (maximum of 3 elective credits) (8 NYCRR §100.5[d][9]);
2. making up incomplete or failed course credit (8 NYCRR §100.5[d][8]);
3. earning credit by examination (maximum of 6 1/2 credits) (8 NYCRR §100.5[d][1]); and
4. earning credit through completion of online and blended courses (proposed 8 NYCRR §100.5[d][10]).

According to well regarded work on this topic, America's Lab Report: Investigations in High School Science (National Research Council, 2006), laboratory experiences are defined as follows:

Laboratory experiences provide opportunities for students to interact directly with the material world (or with data drawn from the material world), using the tools, data collection techniques, models, and theories of science.

This definition includes student interaction with astronomical databases, genome databases, databases of climatic events over long time periods, and other large data sets derived directly from the material world. It does not include student manipulation or analysis of data created by a teacher to simulate direct interaction with the material world. For example, if a physics teacher presented students with a constructed data set on the weight and required pulling force for boxes pulled across desks with different surfaces and asked them to analyze these data, the students' problem-solving activity would not constitute a laboratory experience in the committee's definition.

In the committee's view, science education includes learning about the methods and processes of scientific research (science process) and the knowledge derived through this process (science content). Science process centers on direct interactions with the natural world aimed at explaining natural phenomena. Science education would not be about science if it did not include opportunities for students to learn about both the process and the content of science. Laboratory experiences, in the committee's definition, can potentially provide one such opportunity.

Discussion surrounding the laboratory requirement and laboratory experiences should reflect the advancements in science, developments of new technologies, and

current research on science education (teaching and learning) and cognitive science that will better prepare learners for the demands of citizenry, college and careers. Any amendments to the science requirements under clause 100.5(b)(7)(iv)(d) must consider regulatory language that addresses opportunities for quality laboratory experiences and demonstration of competencies towards mastery of the learning standards while earning a unit of credit as reflected in subdivisions 100.1(a) and (b):

- a. **Unit of study** means at least 180 minutes of instruction per week throughout the school year, or the equivalent.
- b. **Unit of credit is earned by:**
 1. the mastery of the learning outcomes set forth in a New York State-developed or locally developed syllabus for a given high school subject, after a student has had the opportunity to complete a unit of study in the given subject matter area.

Recommendation

It is recommended that the Regents direct Department staff to convene a group of science, technology, and education stakeholders including teachers and leaders from school districts, institutions of higher education, and business and industry to:

- review and evaluate the science laboratory requirement;
- consider and appraise current available research on teaching and learning in science; and
- make recommendations to the Board of Regents regarding amendments to current clause 100.5(b)(7)(iv)(d) of the Commissioner's Regulations.

In doing so, the following will be considered:

- hands-on, inquiry-centered laboratory experiences are essential foundations for college and career readiness, and citizenry in a scientific and technological global economy;
- the College Board unequivocally supports hands-on laboratory or field experiences as required for course approval, just as it unequivocally supports the concept of flexibility in AP course delivery. (Currently AP courses that combine hands-on and virtual laboratory experiences but do not meet a minimum hands-on requirement receive a one year conditional approval from College Board.);
- the long history of the laboratory requirement in providing students with opportunities for hands-on scientific experiences preparing them for citizenry, and colleges and careers;
- an increasingly scientific and technological world demands the ability to conduct scientific inquiry through investigation, exploration, and discovery of the natural world;

- non-traditional settings and the provision of equitable access and opportunities for satisfying the laboratory requirement. For example, opportunities for on-demand teaching and learning that incorporate advancements in learning technologies such as online and blended courses;
- the limited empirical research on the effectiveness of online, simulated, or virtual laboratory experiences in relation to increasing student achievement or mastery of the content, concepts, and process skills in the sciences;
- future amendments to subdivisions 100.1 (a) and (b) and the relationship to clause 100.5(b)(7)(iv)(d) to ensure college and career readiness; and
- input from the field regarding the need to amend the current regulations surrounding the laboratory requirement.