

Advanced Placement and International Baccalaureate

Do They Deserve Gold Star Status?

BY:

Sheila Byrd

WITH:

Lucien Ellington

Paul Gross

Carol Jago

Sheldon Stern

FOREWORD BY:

Chester E. Finn, Jr. and

Martin A. Davis, Jr.

November 2007



**THOMAS B. FORDHAM
INSTITUTE**



The Thomas B. Fordham Institute is a nonprofit organization that conducts research, issues publications, and directs action projects in elementary/secondary education reform at the national level and in Ohio, with special emphasis on our hometown of Dayton. It is affiliated with the Thomas B. Fordham Foundation. Further information can be found at www.edexcellence.net, or by writing to the Institute at 1701 K Street, NW, Suite 1000, Washington D.C., 20006. The report is available in full on the Institute's website; additional copies can be ordered at www.edexcellence.net. The Institute is neither connected with nor sponsored by Fordham University.

Advanced Placement and International Baccalaureate

Do They Deserve Gold Star Status?

BY:

Sheila Byrd

WITH:

Lucien Ellington

Paul Gross

Carol Jago

Sheldon Stern

FOREWORD BY:

Chester E. Finn, Jr. and

Martin A. Davis, Jr.

November 2007



THOMAS B. FORDHAM
INSTITUTE

★ ★ ★ ★ Contents

Foreword 5
By Chester E. Finn, Jr. and Martin A. Davis, Jr.

Introduction 7
By Sheila Byrd

REVIEWS OF COURSES AND EXAMS

Advanced Placement

Biology 22
Calculus AB 25
English Literature & Composition 29
U.S. History 33

International Baccalaureate

Biology SL 37
Mathematics SL 40
Language A SL 44
World History SL 48



★ ★ ★ ★ Foreword

By Chester E. Finn, Jr. and Martin A. Davis, Jr.

Over the ten years of Fordham’s modern existence, we have panned vigorously for gold—curricular gold. This quest has frequently left us disappointed, as our reviews of state standards have consistently shown that expectations for American primary and secondary students are typically weak and watered down.

Worse, at the high school level, state standards have few teeth. Because fewer than half of U.S. states require high school students to complete exit exams or standardized end-of-course exams, schools may choose to follow their state’s standards, or not.

But a push to improve high school standards is on. Education Secretary Margaret Spellings would like to extend the No Child Left Behind Act to cover high school and has announced her desire to “align high school standards with college and work.” The National Governors Association agrees, stating that “all young people should take a rigorous college-prep curriculum.”

Increasingly, what people mean by phrases such as “rigorous college-prep curriculum” is the Advanced Placement (AP) or the International Baccalaureate (IB) program. We wanted to know if these programs are as good as conventional wisdom thinks they are.

Both have been around a long time (fifty and forty years, respectively), enjoy a reputation for academic excellence, and are growing in popularity. But are they academically sound, or given to flights of educational whimsy? Have they resisted the postmodernist silliness that infects so much of the academy? Do their curricular frameworks, study guides, and sample tests stand up to scrutiny?

To find out, we recruited **Sheila Byrd** to lead our investigation. We could think of no one better. She has taught English in District of Columbia public schools, as well as in international schools in Italy and Japan. She’s also a founding director of the American Diploma Project, and a former deputy executive director of the California Academic Standards Commission.

Sheila, in turn, persuaded five scholars to assist with the project. We’ve trusted these folks before; each played a prominent role in our reviews of state standards. Given the seriousness with which their work has been taken by both friends and foes of Fordham, we knew that their reviews of the AP and IB courses would be thoughtful, astute, and fair.

In history, we turned to **Lucien Ellington** of the University of Tennessee at Chattanooga to review IB World History and its “Americas” option, and to **Sheldon Stern**, formerly of the John F. Kennedy Library, to review AP U.S. History. Both are defenders of history courses that are chronologically structured and content-rich, eschewing the trend that emphasizes social-studies-like “themes” such as continuity and change.

Paul Gross handled the reviews of AP and IB biology courses. A former head of the Marine Biological Laboratory at Woods Hole and former provost of the University of Virginia, Gross understands that students cannot develop the creative and critical skills needed to ask the probing questions that lead to scientific advances unless they first learn the terminology and hard facts of science.

For English, we asked **Carol Jago** to review the IB course and **Sheila Byrd** herself to handle the AP course. Ms. Jago directs the California Reading and Literature Project at UCLA and edits the quarterly journal *California English*. Both of them respect the study of literary criticism but understand the importance of mastering a core set of great literary works.

David Klein advised on the reviews of AP and IB calculus. A professor of mathematics at California State University, Northridge, Dr. Klein has long held that students must master analytical skills first—and not depend overmuch on calculators to replace brainwork.



We are grateful for their hard work, sound judgment, and keen analytical skills. We also appreciate the work of the many staff members who contributed to this study, including Fordham intern Heather Cope. We also thank Anne Himmelfarb, who copyedited the report, and Holli Rathman, who created the pages' appealing design.

The results that Sheila and her team returned to us were mostly encouraging. Our reviewers looked at the four AP and IB courses most similar to the core content areas in American high schools—English, history, math, and science—and found that, in general, the courses do warrant praise. In a few cases, they deserve gold stars. Both biology courses scored As, and the English and history courses all secured grades in the B range. (Readers familiar with Fordham will know that high grades are hard to come by around here.) Math, on the other hand, fared less well: the IB math course earned a B-, while AP Calculus emerged with a C+.

On the whole, these programs succeed for two reasons. First, both set high academic standards and goals for learning that are well delineated for teachers, students, and parents. Equally important, the exams for both programs are well aligned to their standards, testing students on the content of their courses and considerably more. Students are also expected to make sense of complex, and sometimes contradictory, materials; to write and defend their opinions about these materials intelligently; and to apply their knowledge in creative and productive ways. These are all skills that will serve them well in later years—and that should find their way into state standards, too.

Second, these programs are linked with real-world benefits. AP and IB students not only develop knowledge and skills that better prepare them for college, but they can earn college credit for their efforts—a good motivation to stay with the program.

That's not to say that these programs are perfect. Though generally strong, there are some disturbing holes in their curricula, especially in the math courses and in the reading lists for both programs' English courses.

And while we're generally happy with AP and IB, we don't believe that every school in the country should rush to embrace them for all students. Though this issue is beyond the scope of our study, it's worth noting that successful implementation of these programs depends on the availability of talented, motivated, and well-educated teachers. As long as teacher certification regimes, school-district HR processes, and collective bargaining agreements conspire against the recruitment and development of such teachers at scale, particularly in our neediest schools, then the experiment to radically democratize access to the AP and IB programs is fraught with risk.

Nor can we be certain that these programs will maintain their rigor in the future. The College Board, for example, is currently revising its history and science curricula to address the criticisms of "progressive" educators. Under the proposed changes, as we understand them, U.S. history students may spend less time studying the names, dates, events, documents, and movements important to our history, and more time talking about such themes as "politics and citizenship" or "continuity and change." Science students may also spend more time on themes ("science as progress," for example) and on "investigative" learning, and less time on the material and terminology required to work at more-advanced levels.

These decisions are not set in stone, and it's important for individuals and organizations to register their concerns now. For if the College Board kowtows to trendy ideas on history and science, it is more likely to do the same when other courses come up for revision.

For now though, AP and IB deserve most of the esteem in which they are held. Parts of the two programs are 24-karat (alignment of standards to exams, the AP and IB science courses), while others are less pure (their math offerings, for example). But they're mostly gold and mostly worthy of emulation.

★ ★ ★ ★ Introduction

The Power of AP and IB

Advanced Placement and International Baccalaureate. AP and IB. The names and acronyms roll like mantras off the tongues of true believers.

For many people committed to strong academic standards, the “advanced” high school courses offered through the College Board’s Advanced Placement program and, increasingly, the Diploma Programme of the International Baccalaureate Organisation (IBO) represent the curricular gold standard for secondary education. Admissions directors and professors at America’s most competitive colleges have long encouraged this view.

Federal policymakers have also caught the AP/IB bug. They see in these courses the opportunity to give many more children access to first-rate curricula, so they’ve poured a lot of money into them. In 2006, for example, the U.S. Department of Education awarded thirty-three grants, totaling \$17 million, to boost participation among low-income students in Advanced Placement courses and tests. The Department of Education has also awarded over \$2 million to the International Baccalaureate of North America to seed its expansion in Title I schools, and IBO receives financial support through the department’s Magnet Schools Assistance Program.

Numerous state-level incentive programs also seek to boost participation in AP and IB. Many states, for example, will pay students’ exam fees; teachers may receive bonuses if their students pass the exams; and some states are even beginning to require their school districts to offer AP and IB.¹

Philanthropists keen to raise academic achievement have given serious money to these programs, too. The National Math and Science Initiative, Inc. (NMSI), launched by ExxonMobil, gave \$13 million to increase to 150 the number of school districts offering AP and pre-AP math, science, and English courses.² In 2006, the Bill & Melinda Gates Foundation made a \$16 million grant to help the College Board expand its EXCEerator program in Chicago, Washington, D.C., and Duval County, Florida. Designed to improve graduation and college readiness rates, particularly for low-income and minority students, EXCEerator is “aimed at dramatically increasing enrollment and success in advanced courses—especially Advanced Placement (AP) courses.”³

Taken at face value, policies that induce more students to sign up for rigorous high school courses are swell. Only a churl would argue against offering the best educational opportunities to more youngsters. As Robert Maynard Hutchins remarked decades ago, “The best education for the best is the best education for all.” Both AP and IB have been around for a long time (about fifty and forty years respectively); competitive universities around the planet use their student assessment data to make admissions or placement decisions; and the excellence of U.S. high schools is increasingly judged (e.g., by *Newsweek*) by the number of AP or IB courses they offer. ★

Yet not everyone has climbed onto this education bandwagon. Ironically, some of the very institutions that gave AP its sheen—elite private and public high schools—are actually climbing off, even as more rural, minority, and inner-city students gain access to this program.⁴ Critics such as some educators at Scarsdale High School suggest that the mission of education is not “to steal a head start on college” by allowing students to earn college credit and shorten their stay at institutions of higher learning; it is rather to cultivate “habits of mind” such as “ambiguity, persistence in the face of setbacks, and the ability to work with others on complex problems.”⁵ Scarsdale High School is now in a transition period, phasing out many AP courses and replacing them with advanced courses of their own design. Some elite private schools, like the Sidwell Friends School in Washington, D.C., have also dropped all but a few AP courses, opting—like Scarsdale High—to create their own intensive or “advanced topic” courses. These educators posit that AP courses are too rigid, confining, and single-minded, that they are a means to the ends of college admissions and credit rather than an opportunity for deep learning.

At the same time, selective colleges and universities are showing some discomfort with the swelling population of students taking advanced coursework; they've been raising the minimum AP exam score that students must earn before the institutions will award them college credit. Some observers insist that the shift is prompted by college finances—better to collect four full years of tuition than to permit students to place out of multiple semesters without paying a cent for those credits. Others say it's an effort to increase institutional prestige in the ever more competitive admissions environment. Still others contend that the shift in policy reflects a real apprehension that the AP course content and exam-scoring rubrics have been watered down in order to attract more (and more diverse) participants. More minority students are indeed taking AP classes, though they are not passing the tests at rates comparable to white students.⁶ In response to concerns about course-quality slippage, the College Board is now requiring that it approve teachers' syllabi before a course can rightfully be labeled "AP." Some teachers familiar with the audit doubt its ability to ensure quality control.⁷

AP and IB—Pure Gold?

For all the attention given to AP and IB, few have focused on the most important questions of all: are these programs teaching students the right stuff? Will a young person completing their courses and passing their tests have learned the most important things they will need to know in order to succeed in college and beyond?

To be sure, strong opinions exist on this subject, especially from the fringes. Educational progressives fret that AP courses are "a mile wide and an inch deep" and overly focused on "content"; some political conservatives grumble that the IB is an internationalist plot, designed to undermine American exceptionalism and culture. In the education mainstream, however, most practitioners, business leaders, and policymakers seem instinctively (or by habituation) to trust the AP and IB brands as marks of curricular excellence.

We wondered whether this trust is warranted, whether AP and IB should, in fact, be considered the gold standard for secondary education. If the content and skills taught by these courses really do represent what most, maybe even all, high school graduates should ideally have mastered, then access to these programs should surely be widened. If not, why spend so much time, money, and energy to encourage their proliferation when states are already expending significant amounts of each to refine and strengthen their own standards-based systems and improve articulation between their K-12 systems and the requirements of colleges, universities, and employers?⁸

This study is designed to determine whether these courses indeed represent a gold standard, and to assist policymakers as they gauge the worth of expanding AP and IB throughout the land.

★ Overview of the AP and IB Programs

The **Advanced Placement Program** was seeded over fifty years ago when faculty from elite U.S prep schools joined professors from some of the nation's most illustrious colleges to devise a way, according to the College Board, "to work together as part of a continuous process, to see themselves as two halves of a common enterprise." The group published a report in 1952 recommending that secondary schools "recruit imaginative teachers, that they encourage seniors to engage in independent study and college-level work, and that achievement exams be used to allow students to enter college with advanced standing." Pilot exams began in 1956, and today the College Board offers tests in thirty-seven subjects. Although the program was designed as a college *placement* incentive, taking AP courses has clearly become a significant factor in the college *admissions* process. Counselors often tell students that they must complete a certain number of AP courses to be deemed plausible candidates to enter America's best colleges and universities.

Despite the stakes involved in AP courses, the College Board does not require teachers to be specially trained in any way before they teach them. Nor does the board mandate how these courses are structured and presented, as IB does to a greater extent.

Still, AP teachers aren't left to fend entirely for themselves. The College Board makes available—in many cases online—course outlines and teachers' guides, along with sample exam questions and syllabi. Teachers may also purchase curricular materials from the College Board and pay to participate in the many professional development activities it offers throughout the country.

Students take “on-demand” exams at the end of an AP course, each of which includes roughly sixty multiple choice (“selected” response) questions and several essay (“constructed” or “free” response) questions. Students earn scores of one to five, five being the highest. Historically, scores of three or higher yielded credit for matriculating students at U.S. colleges and universities, although an increasing number of colleges are raising their minimum scores for credit. Harvard University, for example, now requires a student to receive a five on an exam in order to receive college credit. Other universities are sure to follow suit. Nonetheless, over three thousand colleges and universities today still grant credit for AP scores of three or above.

Nearly 60 percent of U.S. high schools participate in the AP program. High schools may offer as many AP courses as they like, and students may take as few or as many of these courses as they want, though schools often establish prerequisites for enrolling in them.

The cost of AP to individual schools varies greatly. The only set costs are for the exams themselves, which generate a significant revenue stream for the College Board (two million exams annually at \$84 each). Schools may opt to send their teachers to professional development seminars sponsored by AP, at an average cost of \$125 per workshop.

The **International Baccalaureate’s Diploma Programme** (DP) was founded in 1968 “to facilitate the international mobility of students preparing for university by providing schools with a curriculum and diploma recognized by universities around the world.”¹⁰ Today, the Diploma Programme is a two-year curriculum for high school juniors and seniors, offered in 126 countries and forty-four states in the U.S., plus the District of Columbia. While the IBO has more recently introduced a Middle Years Programme (MYP) and a Primary Years Programme (PYP), the DP is far more prevalent, with roughly twice as many DPs in North America and the Caribbean as MYPs, and almost five times as many DPs as PYPs, the IBO’s newest program offering. (Both the PYP and MYP are designed to prepare students for the DP.)

Universities can grant college credit for successful completion of the Diploma Programme (if students attain designated scores on IB assessments) much in the same way that they grant credit for AP courses. Most competitive universities in Europe offer recognition for the IB diploma, though currently just 828 U.S. colleges and universities offer credit for IB coursework. Still, the IB program is growing, especially in North America, and particularly in the United States. Since 1997, the number of diploma programs in North America has grown from 227 to 624. In 2007, there were 27,960 diplomas awarded worldwide, with 10,146 of them awarded in the United States (up 7 percent from 2006). As it grows in recognition, the IB program is also becoming both a placement and an admissions vehicle.

Unlike the AP program, which permits schools to offer as many or as few courses as they choose, the IBO requires that schools offer its complete program; they cannot pick and choose. Coursework is divided into six groups:

- Group 1: Language A1 (literature)
- Group 2: Second Language (foreign language)
- Group 3: Individuals and Societies (e.g., history, economics)
- Group 4: Experimental Sciences
- Group 5: Mathematics and Computer Science
- Group 6: The Arts

Students must take courses in each of the six groups. However, there are two exceptions. If a student is fluent in two languages, he or she can take a second Group 1 subject instead of a Group 2 subject. The other exception is that students may replace a Group 6 subject with another subject from Groups 2, 3, 4, or 5.

Nearly all subjects are offered in two flavors, Standard Level (SL) and Higher Level (HL). In general, SL courses are 150 classroom hours in length, and HL courses are 240 hours. Students must study three of their six subjects at the higher level, allowing them to explore areas of interest in greater depth and at a more rigorous level. Comprehensive curriculum guides contain course aims, objectives, a syllabus “outline” and “details,” and assessment “details” and “criteria.”



Students are assessed “internally” at the classroom level (through essays, oral examinations, or other projects graded by teachers) and “externally” (through exams prepared, administered, and scored by IB examiners) in all six content areas. For the courses we examined, the external assessments count for 70 to 80 percent of a student’s final course grade.

All IB assessments measure individual performance against stated objectives delineated in the curriculum guides published by the IBO. Teachers grade the internal assessments using the criteria specified by curriculum guides and by “markschemes” (which have instructions for grading and examples of graded exams). To ensure that teachers mark exams correctly, each year they must submit samples of student work and assigned grades to IB officials for “moderation.” IB examiners have the right to change the grade.

To receive an IB diploma, students must complete the required coursework and pass both internal and external exams. They must also fulfill these core requirements:

- ★ A passing grade on a four thousand-word “**extended essay**,” comparable to a rigorous research paper or thesis, on a topic of the student’s choosing.
- ★ Successful completion of the interdisciplinary **Theory of Knowledge (TOK) course**, designed to provide “coherence” by exploring the nature of knowledge across all disciplines. This course requires a twelve- to sixteen-hundred-word essay.
- ★ Successful completion of the **Creativity, Action, Service (CAS) requirement**. Participation in a school’s CAS program requires students to be involved in artistic pursuits, sports, and community service work.

Students are awarded “diploma points” for completing each of these requirements and must earn a set number of points to earn an IB diploma. Additional diploma points are awarded for performing well on the internal and external assessments described above.

Before schools are authorized by the IBO to offer the Diploma Programme, they must complete a rigorous self-study and other accreditation-type measures. Moreover, formal teacher training is required of all IB teachers. Once a school is authorized to offer the program, it is reevaluated every five years.

The annual fee for schools to offer the Diploma Programme is currently \$8,850 per school, and the cost to IB students is \$627 for the diploma, which is based on a candidate registration fee of \$123 and six subject fees of \$84 each.



Grading AP and IB

What We Reviewed

The key reason for appraising the IB and AP programs was to gauge their use as curricular gold standards or models for U.S. high schools, so we opted to examine the courses in both programs that most closely represent the four typical U.S. core-content areas for U.S. high school students: English, history, science, and math.

For the AP program, we looked at the following four courses:

- ★ English Literature and Composition
- ★ U.S. History
- ★ Biology
- ★ AB Calculus (There are two calculus courses offered: AB, which covers two-thirds of a year-long college calculus course, and BC, which covers a full year of college calculus. We reviewed the AB course.)

For the IB Diploma Programme, we looked at the following four courses:

- ★ Language A1 English—Standard Level¹¹ (Because the program is international, no U.S. literature course exists.)
- ★ World History—Standard Level¹² (We also looked at, but did not issue a grade for, the “Americas” option. This covers the U.S., Latin America, and Canada and is offered only to students studying World History HL. Because the IB curriculum is “international,” no explicit U.S. history course exists.)
- ★ Biology—Standard Level
- ★ Mathematics—Standard Level (This is the base course for students who don’t plan to major in a math-intensive subject, such as physics, in college.)

These IB courses span four of the six groups of courses described in the previous section (“Language A1,” “Individuals and Societies,” “Experimental Sciences,” and “Mathematics and Computer Sciences,” respectively). Because we examined the courses that most closely resemble the four U.S. core-content areas, we did not look at some other courses that IB requires, such as second languages and the arts.

The Reviewers

The reviewers for all four subjects are experts in their fields and veteran evaluators of state academic standards. Their prior work for the Thomas B. Fordham Foundation in examining state standards enabled us to make rough comparisons between those standards and the academic expectations of AP and IB.

To review the AP and IB biology materials, we turned to the eminent biologist **Paul Gross**, former head of the Marine Biological Laboratory at Woods Hole and former provost of the University of Virginia. He authored Fordham’s *The State of State Science Standards 2005*. ★

Lucien Ellington, professor of history at the University of Tennessee at Chattanooga, was called upon to review the IB World History course as well as that course’s “Americas” option. An expert in Japanese history and editor of *Education About Asia*, he also has considerable experience with K-12 curricula. He works closely with the Core Knowledge Foundation and has evaluated a number of states’ world history standards. He was involved in the Fordham review of state standards for world history in 2006.

American historian **Sheldon Stern** reviewed the AP U.S. history curriculum. Retired from his post as historian at the John F. Kennedy Library in Boston, he was the founder and director of the American History Project for High School Students. He has authored *Averting “The Final Failure”: John F. Kennedy and the Secret Cuban Missile Crisis Meetings*, as well as the Fordham publication *Effective State Standards for U.S. History: A 2003 Report Card*. Dr. Stern has also been immersed in developing and evaluating K-12 standards in Massachusetts and has received numerous awards for his work promoting U.S. history in secondary schools.

The AP and IB math course reviews were written by Chester E. Finn, Jr., Martin A. Davis, Jr., and myself with critical guidance from **David Klein**, professor of mathematics at California State University, Northridge, who has deep experience in K-12 math issues. He previously led the Fordham Foundation study that produced *The State of State Math Standards 2005*.

Reviewers for the AP and IB English courses are both former high school English teachers. **Carol Jago**, who reviewed the IB Language A course, has taught English in middle and high school in Santa Monica, California, for thirty-two years. She also directs the California Reading and Literature Project at UCLA and edits the California Association of Teachers of English quarterly journal, *California English*. Ms. Jago participated in Fordham’s 2005 review of state English standards and is currently vice-president-elect of the National Council of Teachers of English.

I reviewed the AP English Literature and Composition course and served as lead investigator for this project. I have taught English in D.C. public schools, as well as in international schools in Italy and Japan. Outside the classroom, I served as the founding director of the American Diploma Project, and, before that, as the deputy executive director of the California Academic Standards Commission. I have helped develop K-12 content standards, curricula, and assessments in over a dozen states, overseas, and for charter schools in New York and Washington, D.C.

Grading the Curricula

We asked our reviewers to consider the following criteria as they determined the extent to which a course reflects a legitimate gold standard for U.S. high school students:

1. Content (60 percent of grade)

The content of course outlines and associated exams was considered with an eye toward answering these questions:

- a. Is the content properly chosen, and does it reflect a gold standard for what graduating high school students should know and be able to do in this content area? Do the materials provided to teachers by the examining body (e.g., course outline/guidelines/curriculum) provide sufficient guidance about the content knowledge and skills required to do well on the exam?
- b. Does the exam align to the content of the course guidelines/curriculum set forth by the examining body? If not, are the content and performance expectations of the exam better or worse than the course guidelines/curriculum at setting a “gold standard” for exiting high school seniors? Why or why not?

2. Rigor (30 percent of grade)

A course could have good content (criterion 1, above), and that content could be described in a clear, organized way (criterion 3, below), yet the course overall might still not have an appropriate level of intellectual challenge for exiting high school seniors (as reflected in the exam as well as in course outlines). Overall, how rigorous is the course?

3. Clarity (10 percent of grade)

Are the materials understandable, well organized, and teacher-friendly?

Summary of Findings

Applying the above criteria, reviewers developed summary grades for each of the courses. Awarded grades ranged from “C” to “A.” English and biology courses in both programs earned the highest grades, while math and history courses received less praise.

(The detailed reviews, by course, follow this overview.)

Table 1: Grades for Advanced Placement Courses

Advanced Placement Course	Grades by Criterion	Overall Grade	Strengths and Weaknesses
AP English Literature and Composition	Content (60%) B+ Rigor (30%) A Clarity (10%) B-	B+	STRENGTHS: Rigorous and comprehensive exam; “Formalist” approach to writing WEAKNESSES: Curricular expectations tentative, must be discovered by teachers; the teacher’s guide, once the user actually finds it, is difficult to navigate.
AP Calculus AB	Content (60%) C Rigor* (30%) C <i>*includes mathematical reasoning</i> Clarity (10%) B	C+	STRENGTHS: Course description clearly written; exam well-crafted and aligned to curriculum WEAKNESSES: Missing or abridged topics of importance; overreliance on technology, resulting in a de-emphasis on analytical skills
AP U.S. History	Content (60%) B- Rigor (30%) B- Clarity (10%) B-	B-	STRENGTHS: Demanding, well-constructed, content-rich exam WEAKNESSES: Unifying themes are tendentious, emphasizing <i>pluribus</i> instead of <i>unum</i> ; topics mention very few actual historical events; sample syllabi disconnected from course description
AP Biology	Content (60%) A- Rigor (30%) B Clarity (10%) A	A-	STRENGTHS: Course description is specific and straightforward; demanding exam assesses conceptual understanding, but is also content-rich WEAKNESSES: Exam content more shallow than an introductory biology class for majors at research universities



Table 2: Grades for International Baccalaureate Courses

International Baccalaureate Course	Grades by Criterion	Overall Grade	Strengths and Weaknesses
Language A English SL	Content (60%) B Rigor (30%) A Clarity (10%) A	B +	<p>STRENGTHS: Rigorous and comprehensive exam; detailed and rigorous expectations for literary analysis skills</p> <p>WEAKNESSES: U.S. students in IB programs might miss exposure to core U.S. literature</p>
Math SL	Content (60%) B- Rigor* (30%) C <i>*includes mathematical reasoning</i> Clarity (10%) B	B-	<p>STRENGTHS: Curriculum guide clearly written; rigorous, comprehensive assessments</p> <p>WEAKNESSES: Reliance on technology, resulting in a de-emphasis on analytical skills; some important pre-university content missing</p>
World History SL	Content (60%) C Rigor (30%) A Clarity (10%) B	B-	<p>STRENGTHS: Demanding, well-constructed, content-rich exams; strong content within the narrowly defined course parameters</p> <p>WEAKNESSES: U.S. students in IB programs could miss exposure to almost all core U.S. History content; even as a <i>world</i> history course, its 20th-century focus is too narrow; lacks emphasis on important chronological knowledge</p>
Biology SL	Content (60%) A + Rigor (30%) A + Clarity (10%) C	A	<p>STRENGTHS: Depth and coverage of content in curriculum guide; comprehensive assessment system</p> <p>WEAKNESSES: “Systematization” of the program could confuse or overwhelm teachers or stifle curricular inventiveness</p>

English

Both the AP English Literature and Composition and the IB Language A1 English SL courses earned high marks (B+) from our reviewers. These courses require students to be well grounded in literary genres and forms, to understand the identifying characteristics of important works, and to appreciate the stylistic techniques that enliven those works. Both reviewers praise the exams associated with these courses, but express caution about the density and verbosity of the AP *Teacher's Guide* and the IB *Curriculum Guide*. Concerns are especially acute for the AP guide.

Neither AP English Literature and Composition nor IB Language A1 SL requires all students to read specific works of literature, meaning that teachers of both courses must select works that will sufficiently prepare their students for the exam. The AP provides a list of “representative” authors (not “required” or even “recommended”). The IB list is more prescriptive, requiring that most books for the course come from one of two lengthy reading lists. Teachers must select titles in certain genres and eras, ensuring that students receive broad exposure, but teachers are given wide latitude in selecting books.

If U.S. high school students took either of these courses as their only upper-level literature course, we could not be confident that they would explore and analyze a comprehensive body of foundational U.S. literature. The AP list leaves too much choice to the teacher, while the IB list is, by design, international in scope and thus could limit the number of American authors that students read. The risk is probably greater in the case of the IB course because its students must enroll in the IB program in eleventh grade, leaving little room for electives during the final two years of high school. By contrast, a student could take AP English Literature and Composition in twelfth grade following a course in U.S. literature taken in eleventh grade, as many state and local curricula prescribe.

History

Neither the AP U.S. History course nor the IB World History SL course receives a distinguished grade (both earn a B-), although our reviewers have good things to say about aspects of both, especially the exams. In AP U.S. History, the curriculum is divided into twelve themes that have little to do with one another. Hence, students run the risk of taking a class that bounces from diversity issues to economic issues to religion to war to slavery, with little rhyme or reason. The once-common civic core of historical knowledge, writes reviewer Sheldon Stern, has been replaced by themes and “unifying” concepts that “barely touch on, or miss altogether, the most historic, far-reaching, and unifying political development in early America: the evolution of democratic bonds and cohesion from which a nation was ultimately forged with a shared and increasingly inclusive commitment to political freedom, democratic values, civic participation, and individual rights.”

Yet all is not lost. The themes are meant to serve only as organizers for teachers. The College Board also provides an outline of important historical facts and details that is meant to be used in conjunction with the themes. ★

Unfortunately, a recent decision by the College Board to redesign the U.S. history course could change this setup. The College Board seems to be moving toward placing more emphasis on the very “themes” (or “big ideas” in the redesign lingo) that Stern decries—potentially at the expense of required exploration of important historical facts and events. Such a development might tip over the brink a course that already hovers on the edge. (For more on the AP redesign, see page 17.)

The IB does not offer a U.S. history course, but for students studying world history at the higher level, instructors can teach an Americas option, which covers U.S., Latin American, and Canadian history. Lucien Ellington took a look at the Americas option for us to see if it could potentially serve as a model U.S. history course for American high school students. He argues that this option contains some good information, but because it includes much more than U.S. history, the course inevitably slights important topics, events, and people that all U.S. high school students should know.

The IB World History SL course, according to Ellington, would be first rate were it not confined to recent times. (A new standard for World History goes into effect in September 2008. All comments refer to the 2001 guide.) Its in-depth analysis of twentieth-century history, and its requirement that students learn to *do* his-

tory as well as simply read it, make the IB World History course an excellent introduction to how to study history. Unfortunately, as structured, it all but ignores events prior to the nineteenth century. So it's conceivable that IB students could graduate with little or no grounding in Mesopotamia and Egypt, Greece and Rome, early Islamic history, the European Middle Ages and Renaissance, the classical age of China, and other crucial periods and cultures that set the stage for modern history.

Science

Paul Gross examined the AP Biology and the IB Biology SL courses and awarded both high marks. He reports that the AP Biology course compares favorably with the average two-semester, introductory college biology course. The course outline contains the necessary level of detail about essential biological content, despite its use of some potentially troubling “themes,” “topics,” and “concepts.” Fortunately, like the AP U.S. History “themes,” the biology themes function primarily as organizational tools, mitigating their potentially tendentious effect.

As for the IB course, Gross praises the rigor and comprehensiveness both of the curriculum and of the IB's formative and summative assessments, especially the markschemes, which describe for teachers how and why exams are scored as they are. His only concern is that the course is so detailed that “its documents might threaten to confuse, or even to overwhelm, some of the teachers...charged with mounting” it.

But as with the AP U.S. History course, trouble may befall the very good AP Biology course. The College Board has begun the process of redesigning its biology curriculum, largely in response to the National Research Council's 2002 review of “advanced math and science courses.” The proposed redesign may mean that the “themes” that currently play a minor role in the curriculum will ultimately achieve greater emphasis and have a deleterious effect on the course.

Among the NRC's recommendations for changes was that the sponsoring organizations “evaluate their assessments to make sure they measure the conceptual understanding and complex reasoning that should be the primary goal of advanced study.”¹³ Interestingly enough, Gross remarks, both the AP and IB already do a fair job of this, while still maintaining an important and necessary emphasis on factual knowledge. (For more on the redesign, see page 17.)

Math

Both the AP Calculus AB and the IB Mathematics SL courses suffer from content gaps.

★ In the case of the IB course, the curriculum has a decent focus on problem-solving skills, but lacks many important topics, including an introduction to complex numbers, the reciprocal (and inverse) trigonometric functions, and mathematical proofs. Also, the course covers a broad number of topics, but spends too much time on statistics. This skewed emphasis is fine, so long as the students in the course aren't planning to take classes that involve math in college.

The IB exam's free-response items are excellent, requiring reasoning and problem-solving skills “well beyond the normal high school fare.” But calculators play too large a role on exams (and in the course). As we note: “Too many of the problems are calculator based, and there is insufficient assessment of pencil-and-paper algebraic skills upon which much of a university curriculum depends.”

Likewise AP Calculus AB. It, too, has noteworthy strengths. For example, it covers the Mean Value Theorem and its geometric consequences. But the course also displays significant gaps. Among them: its failure to treat the definition and computation of limits, and its weak treatment of the Inverse Function Theorem. And as in the IB course, there's too much emphasis on calculators. The AP Calculus AB exam is well crafted and closely aligned to the curriculum, though we must be mindful that the curriculum itself contains gaps.

All told, university calculus courses do a better job than either the IB or AP in introducing students to this material.

Conclusions

Both the Advanced Placement and International Baccalaureate courses that we reviewed are laudable in varying degrees as curriculum-based programs. In general, academic expectations for these courses are decently expressed, the end-of-course exams are well aligned to the curriculum, and the grading standards are clearly described and accessible to teachers and students. The AP and IB curricula and exams are certainly much better than nearly all of the state standards and exams we have reviewed in years past.

A great advantage for students taking AP and IB exams is the promise of tangible benefits for those who do well on them. Those who succeed have an advantage when they apply to or matriculate at postsecondary institutions. By contrast, doing well on most state-developed high school exams has no notable effect on students' college admission or placement (unless, of course, they fail to pass and are denied their diplomas).

Finally, the IB does a very good job of keeping a tight rein on its programs and teachers. Before schools can offer the Diploma Programme, they must be trained by the IBO. Moreover, IB seeks to ensure consistency of course quality around the globe via a system of standard formative and summative assessments that are administered both internally (by classroom teachers) and externally (by IB examiners). IBO maintains consistency in instructional quality through its oversight of instructors. If the IBO can do all this worldwide, one may fairly wonder why states can't do the same.

But the AP and IB systems are not perfect. Our reviewers express specific concerns about the breadth and/or rigor of some of these courses, and about the accessibility or clarity of expectations in others. Consider AP. Our biggest gripe is that, very often, reading the information contained in the course outline is *not* the best path to understanding what's expected of teachers and students. Rather, teachers must review old exams to grasp what their pupils will be tested on.

IB courses have the opposite problem. Teacher guides for courses are richly detailed, sometimes to a fault. Both in English and biology, the lengthy, verbose documents meant to serve as a roadmap for teachers could easily discourage or confound good instructors trying to sort out what matters and what doesn't.

Another concern relates to the IBO's policy that individual IB courses cannot be offered in schools that don't adopt the entire diploma programme. This restriction prevents more U.S. students from taking advantage of IB courses. Contrast this to the AP program, which makes its courses available to any school with teachers game to undertake them. We just wish the AP program had more quality control mechanisms to ensure that classes are consistently taught to a high level. Surely somewhere between IBO's rigid oversight and AP's laissez faire approach is a happy medium that ensures course quality without unnecessarily limiting the numbers of students who can take advantage of it.



Our greatest concern is that the College Board might unintentionally undermine its very good courses by redesigning them to favor "big ideas" over actual content. Currently in the second year of a five-year, four-phase process for redesigning its science and history courses, the College Board says this process will become the model by which all AP course redesigns are carried out in the future. Hence, the potential damage could go well beyond the science and history courses currently under consideration.

Phase One (in 2006) included a review of "selected, relevant national and state standards," though the only standards listed in the "List of References for Science Redesign" are the National Science Education Standards, which favor a thematic approach to defining standards rather than detailing specific content.¹⁴

At present, a panel of "experts external to the College Board"¹⁵ is conducting a "domain analysis," using a variation of the "understanding by design" process developed by progressive educationists Grant Wiggins and Jay McTighe. The description of the process (scheduled to conclude in 2010) asserts that the College Board "wanted to eschew the tendency to create lists of content and topics," yet there are signs of a bigger problem ahead as they prepare voluminous and complex conceptual frameworks that could confuse rather than clarify.

Under this rubric, panelists will “come to agreement on approximately six to eight big ideas for each course.” Under each of these big ideas, they will then identify “the enduring understandings” of each and “provide the supporting understandings that reveal the multiple contexts in which the enduring understandings can be manifest.”¹⁶ “Knowledge, skills and abilities” (a.k.a. content) are afterwards to be defined. One hopes.

Looks like overkill to us, an enormous process to recreate something that’s already better than good. So often, such projects yield results that sacrifice (or at least neglect) that which made the earlier version commendable. (One recalls the King James Bible, *Gone With The Wind*, and other masterpieces whose updates, rewrites, and overhauls lost the magic.) Indeed, the draft graphic display we reviewed of the “enduring understandings” and “supporting understandings” associated with just one of the “big ideas” for Environmental Science was so dense that we had to magnify the document 500 percent just to read it. And what we then read was less than inspiring. Even at the “supporting understandings” level, the statements are broad and open to interpretation, such as “Indoor air quality may pose a serious human health risk.”

That version did not include the actual detailed course content that students will be expected to master. Still, even if this content turns out OK, teachers and students may never make their way to much of it if they must first whack through the weeds of fifty to sixty conceptual statements in order to reach the essential knowledge and skills.

Thus, the College Board may unintentionally end up exacerbating the very aspects of the courses that our science and history reviewers found most troubling.

These concerns aside, today’s AP and IB courses and exams demonstrate that independent entities can and do make programs and assessments that are rigorous, fair, and intellectually richer than almost any state standard and exam for high school that we’ve seen. It’s difficult to understand why more states don’t emulate these programs rather than paying twice: once to develop their own standards and assessments that don’t function effectively, and again to fund these independent programs because they do a better job.

Recommendations

In addition to asking that they consider the content-specific recommendations offered by our reviewers in the following pages, we recommend that policymakers, the College Board, and the International Baccalaureate Organisation also consider these suggestions:

Recommendations for Policymakers

- ★ *Either make state high school exit requirements and assessments more like the AP and the IB—and make performance on the assessments count in the postsecondary world—or allow AP and IB credits to serve as proof that students have met rigorous high school exit expectations.*

States should stop wasting money creating and administering high school exit exams that test eighth- and ninth-grade content knowledge and skills. Despite their shortcomings, these independently created curricula and assessment systems are far more rigorous and comprehensive than the high school assessments most states administer. They can serve as a guide for policymakers about how to make state assessments better. Although they may be expensive, the cost might be offset by the money states would save by not simultaneously creating and requiring tests that do not provide meaningful assessments of student achievement.

- ★ *As AP and IB grow in the U.S., it is incumbent on federal, state, and local policymakers to insist that, where they support these programs, they also take special care to ensure that students do not miss out on essential American history and literature content.*

By making high school graduation requirements for English and history more specific and more rigorous, districts will have to find ways to make sure that students also meet those requirements in conjunction with any external demands imposed by programs like AP and IB.

Recommendations for the College Board

- ★ *Clarify and organize the content knowledge and skills for each course consistently across subjects, and clearly indicate what content and which skills really matter. Streamline the bloated thematic overlays and unessential prose, which tend to confound—rather than clarify—expectations.*

As noted above, in most cases the AP course outlines and teachers' guides don't provide course instructors with as clear a picture of what's to be taught as do the exams themselves. It seems to us that teachers should not have to infer from the exams what the priorities are for students' acquisition of knowledge and skills. In some cases, such as U.S. History, the course outline is arguably misleading. In many cases, such as English literature, too much prose in too many documents makes it difficult to distill priorities.

We appreciate the fact that the College Board wants to allow teachers flexibility in instruction, but it could be more transparent regarding instructional priorities without dictating how teachers should convey the necessary information.

- ★ *When redesigning AP history and science courses, don't dilute the content by heeding progressive educationists and postmodern academics more interested in having students discuss "big ideas" than imparting to them broad disciplinary knowledge. Providing broad disciplinary knowledge is in fact the intent of the introductory college classes that AP courses are meant to replicate and is arguably the necessary foundation for productive discussions of "big ideas" in upper-level college courses.*

"Step C," as noted in the redesign process description, does allow the College Board's secondary and post-secondary experts a chance to identify specific content for new courses by asking: "What content knowledge is appropriate for each conceptual unit or unit of analysis defined by the method(s) of course organization?" The next part of the question, however, is troubling: "What content knowledge is *not* necessary for each conceptual unit or unit of analysis?" Our fear is that actual content knowledge will be de-emphasized as "big ideas" eclipse facts in a potentially extreme tendency to favor depth over breadth. The College Board should take great care to make sure that doesn't happen.

- ★ *Monitor AP teachers' grading policies, as the IB does, as part of the audit process.*

The College Board's AP course audit (underway now) requires only that teachers submit their syllabi to the College Board for approval. No mechanisms are in place to ensure that these syllabi are actually taught, or that the people submitting them will teach the course from one year to the next. In short, the audit will not supply convincing evidence by itself that the teacher knows the material or is up to the challenge of teaching it. The audit does not require any other quality check once the syllabus is approved. Without such a check, the AP exams are apt to continue to serve as the College Board's only mechanism for quality control. Adopting a common syllabus for each course would be another way to ensure more consistency in course quality, without prescribing teaching methods. ★

If the College Board really wants to ensure consistency in the quality of instruction, it may need to consider adopting policies, such as those used by the IB, to require internal assessment and/or monitoring of consistency among teachers' grading policies. IB teachers must submit samples of student work, along with their assigned grades, to the IBO for external moderation. Grades may be changed if the IBO thinks the work was judged erroneously against the IB criteria.

Recommendations for the International Baccalaureate Organisation

- ★ *The IBO should streamline its curriculum guides to make them less verbose and more user-friendly.*

Given the complex nature of the formative and summative assessments required for each IB course, it won't be easy to streamline these guides, but an attempt to collapse some of their component parts would be helpful for teachers. Most of the guides contain aims, objectives, topic outlines, and assessment criteria, distinctions among which are not always obvious. While we know that IB requires its teachers to be trained, it might also consider explaining in a slightly more prescriptive way how the component parts of each cur-

riculum guide could be organized into a syllabus. For example, the Language A guide could specify which works are good vehicles for instruction in the specific methods of literary analysis, currently disembodied in the “Aims” and “Objectives” sections of the guides. More prescription would leave less room for interpretation and confusion on the part of the teacher, without obstructing creativity in instructional methods.

- ★ *To the extent that the International Baccalaureate Organization wants to increase its presence in the United States, it should consider allowing some of its courses to be taught apart from the Diploma Programme.*

Schools offering the Diploma Programme do allow students to take IB courses without striving for the whole diploma, but IBO might also consider allowing students whose campuses don’t offer the programme to participate in some kind of exchange with other schools within a district, whereby more students *could* take some of the IB courses. Alternatively, charter high schools, many of which are small and don’t have the resources for such programs, might pool resources in order to offer an IB program to a consortium of charters in the same geographic area. State and philanthropic money could be earmarked to support such programs.

This report began by asking whether AP and IB are legitimately viewed as gold standards for secondary education—whether, that is, they teach U.S. high school students what they should know and be able to do upon graduation. Our overall analysis of these two programs—their courses, assessments, and quality control—leads to the conclusion that neither is pure gold, but both are far from fool’s gold. Each could legitimately be sold and bought as gold alloyed with lesser metals.

Clearly, AP and IB set higher goals for students than those established by the states, and their assessments set a standard of excellence that states should aspire to for more, if not all, of their students.

So as state and federal policymakers continue looking for ways to offer all K-12 students a top-flight education, tempered enthusiasm for AP and IB, both as programs in their own right and as models for others, is warranted. Neither is twenty-four-karat gold. But even alloyed as they are with lesser metals, at the high school level they gleam brighter than any state-mandated standards or other curricular guidelines currently available for widespread use in the United States.

¹ Arkansas now requires that all school districts in the state offer AP courses. In Georgia, the legislature this year approved a bill requiring that twenty-four college credits be awarded upon matriculation to students who complete the IB diploma program, but the governor vetoed it. Legislators say they will take it up again. The National Governors Association has awarded \$500,000 to six states to encourage expansion of their AP programs.

² For details, see <http://nationalmathandscience.org/content/view/41/100/>. Focused on expanding “STEM” programs (those geared towards science, technology, mathematics, and engineering) in U.S. schools, NMSI also proposes to award bonuses of \$250 to students who pass AP science, math, and English exams.

³ For details, see “College Board EXCEerator Schools Fact Sheet” at http://www.collegeboard.com/prod_downloads/about/news_info/excelerator.pdf.

⁴ For schools dropping the AP program, see Jay Mathews, “Eager for Flexibility, a Handful of Schools Drop AP,” *The Washington Post*, May 31, 2005. For the rise in rural, inner-city, and minority students signing up for AP, see, http://www.collegeboard.com/prod_downloads/about/news_info/ap/2007/2007_ap-report-nation.pdf (p. 6).

⁵ Joe Berger, “Demoting Advanced Placement,” *The New York Times*, October 4, 2006.

⁶ Daniel de Vise, “Study: Black Students Lag in Success on AP Tests,” *The Boston Globe*, June 29, 2007, at http://www.boston.com/news/education/k_12/articles/2007/06/29/study_black_students_lag_in_success_on_ap_tests/. See also a study by the College Board at http://www.collegeboard.com/prod_downloads/about/news_info/ap/2007/2007_ap-report-nation.pdf (p. 84).

⁷ Jay Mathews, “Auditors Rejecting AP Course Syllabuses,” *The Washington Post*, September 2, 2007.

⁸ See Achieve, Inc., *Closing the Expectations Gap 2007*, available at <http://www.achieve.org/files/50-state-07-Final.pdf>.

⁹ See <http://apcentral.collegeboard.com/apc/public/program/history/8019.html>.

¹⁰ See <http://www.ibo.org/history/>.

¹¹ Of all students taking Language A1, 97.5 percent took the HL. We chose to review the SL course because the HL course is designated for students who plan to major in English in college, versus the SL course, which appears to more closely resemble what all students might need for any postsecondary path.

¹² Of all students taking World History, 94 percent took the HL. We chose to review the SL course because the HL course is designated for students who plan to major in history or related humanities program in college, versus the SL course, which appears to more closely resemble what all students might need for any postsecondary path.

¹³ National Academy of Sciences, *Learning and Understanding: Improving Advanced Study of Mathematics and Science in U.S. High Schools* (Washington, DC: National Academies Press, 2002), p. 14.

¹⁴ The College Board, *A Description of the AP Curriculum and Assessment Redesign Process v3.0* (2007), appendix B, p. 22.

¹⁵ *Ibid.*, p. 5. The composition of experts is as follows: five to six secondary educators; five to six postsecondary educators or practitioners selected “based on demonstrated commitment to expert teaching.” Nominations were sought from “a variety of professional organizations.”

¹⁶ *Ibid.*, p. 9.



Reviews of Courses and Exams

Advanced Placement Biology

By Paul Gross

I. Documents Reviewed

- ★ *AP Biology Course Description*, May 2006, May 2007 (http://www.collegeboard.com/student/testing/ap/sub_bio.html?biology)
- ★ *Teacher's Guide, AP Biology*, College Entrance Examination Board, 2000
- ★ *AP Biology Released Exam*, College Entrance Examination Board, 2002
- ★ Four sample AP Biology syllabi
- ★ *Free-Response Questions, Form B Questions, Scoring Guidelines* for 2004

II. Introduction

The mundane is prominent in the *AP Biology Course Description*, which contains the College Board's official introduction to this program. The course purpose and goal are explicitly stated: AP Biology is designed as the equivalent of, and sometimes a substitute for, a two-semester introductory college biology course for majors. Having stated this intention, however, the *Course Description* devolves into the commonplace. It offers themes, topics, and concepts as an organizing principle—the same boilerplate headings that many state academic standards employ, complete with their characteristic insistence upon inquiry-based learning.

It's not a useless approach to the multidimensional matrix of knowledge that is modern biology. But it hardly encourages one to believe that the AP course will deliver on its straightforward promise of providing “the equivalent of, and sometimes a substitute for, a two-semester introductory college biology course for majors.”

Fortunately, the organizing principle doesn't prevent the *Course Description* from spelling out the core concepts, facts, and details that a student of biology needs to master. In the hands of a competent and savvy teacher, this aspirational document could be the basis for a top-flight overview of the discipline.

The content and assessment emphases were developed using extensive—and continuing—surveys of college faculty who are active in teaching introductory biology, and reflect current prejudices about the biological subdisciplines. That choice of content results in the following standard design and weighting for the course and the assessments:

- ★ Molecules and Cells, 25 percent
- ★ Heredity and Evolution, 25 percent
- ★ Organisms and Populations, 50 percent

This is a fair enough representation of modern introductory college biology, although the first two categories do, or ought to, overlap. There is no longer much distinction between the subject matter of Molecules and Cells and that of Heredity and Evolution. The frontiers of genetics and evolutionary biology are, to a large extent, now located in *molecular* genetics, molecular systematics and phylogeny, and in “evo-devo”—evolutionary developmental biology.¹ In all those, considerations of cellular and molecular processes are indispensable.

III. Content

A. Course Description

There are eight major themes in this course:

- I. Science as Process
- II. Evolution
- III. Energy Transfer
- IV. Continuity and Change
- V. Relationship Between Structure and Function
- VI. Regulation
- VII. Interdependence in Nature
- VIII. Science, Technology, and Society

Themes I and VIII open the door to a good deal of insubstantial philosophy of science and sociology/politics/current events that could be inserted by weak or politically motivated teachers, but they add little to the hard core of knowledge about living things that needs to be learned. The purpose of a good introductory *college* course is at most only secondarily to promote sociocultural wisdom or good citizenship. The purpose, rather, is to inculcate some hard-core knowledge—and foster in students the ability and desire to acquire more knowledge independently.

Fortunately, despite AP’s inclusion of Themes I and VIII in the course description, those two lead to little that affects the assessments. Themes II through VII are adequately comprehensive, and they govern both the course and the exam. They are thoughtfully chosen, provide a very good elementary survey of biology, and appear to align with the AP exams. Most modern college courses highlight these matters, if not as explicit themes, then at least as substantive content to be acquired.

Course organization, in short, including its description, intelligibility, and specificity (for which the *Teacher’s Guide* is especially valuable), is straightforward, as are the statements of purpose.

B. Assessments

The exam is divided into two parts: multiple choice (MC) questions, which are worth 60 percent of the score, and free-response (essay) questions, which make up the remaining 40 percent.

The *Teacher’s Guide* states that the MC questions “now reward conceptual understanding, application, and integration more than fact recall.” Perhaps they do; but fortunately, those rewards are piled atop an unchanged requirement for recalling a large array of facts. The publicly available released exam of 2002 is packed with MC questions designed to test “conceptual understanding.” But in order to answer them, the student must first—in every case—recall plenty of facts. ★

Consider the following sample question: “Which of the following is true about the production of polar bodies in humans? (A) It increases genetic variability. (B) It provides the maximum amount of cytoplasm and resources to the ovum. (C) It occurs in male and female vertebrates during meiosis I. (D) It is completed prior to fertilization. (E) It results in nondisjunction.”

Yes, this question tests conceptual understanding of gametogenesis, but before the test-taker can even begin to conceptualize, he or she must know the following *facts* (an initial list): the definition of a polar body, the cytogenetics of polar body formation, whether or not there is some universal relation between the “cytoplasm and resources” of polar bodies and those of the ova from which they come (there is), whether or not male vertebrates have any cells that undergo meiosis (they do, but they don’t form polar bodies), whether polar bodies can form after fertilization (in some species they do), and what nondisjunction might possibly have to do with the question (nothing!). In short, a distinction in this question between *conceptual* and *factual* content is vacuous.

Likewise, the free-response questions require students to conceptualize, as they should, but this in no way reduces the student’s burden of knowing the terms of reference and the facts to which they refer. Biological facts are everywhere embedded in the language of these tests—to their credit.

If there is a gripe to be had with the assessments, it may be that occasional ambiguities in the MC questions are likely to throw the most clever students off base. For example, question 28 of the 2002 exam asks: “As the initial cleavage divisions proceed in a frog embryo, which of the following results?” The choices offered are: “(A) The embryo increases in size. (B) The cytoplasmic content of the individual cells increases. (C) The yolk mass increases in size. (D) Individual cells become smaller. (E) Individual cells become haploid.” The indicated correct answer is D.

Now, it is certainly true that individual cells become smaller. But the clever student who has studied and absorbed frog embryology will have some doubts. To wit: Answers A, C, and E are quickly discounted. This leaves B and D. D first. Although D is true, the student reasons, there’s a huge range of cell sizes in the early embryo. Some are big and fat and full of yolk. Some are small and have no yolk at all. So on to B. It certainly is true that, as cleavage proceeds, most of the new cells are forming at the animal pole, and that’s where most of the clear cytoplasm is. As those little cells are cut up into smaller and smaller cells, the few yolk granules left are squeezed out. So yes, for these cells (anyway), the cytoplasmic *content*—the yolk-free stuff—is going up very, very fast, compared with the whole uncleaved egg. And the *average* yolk content *per cell* goes down. OK, the student thinks, the answer is a choice between B and D. B is subtle. That’s what they must be getting at here. I’ll mark B.

Perhaps it *is* fair to penalize the over-analytical, suspicious, too-clever student for such a choice. D really is, of all the available choices, the best one, but there is an interesting grain of truth for the too-knowledgeable test-taker in B that would not occur to a less imaginative and less well-prepared student. This is the familiar dilemma of MC question design, especially for questions requiring thought rather than “mere” recall of fact and demanding selection of the *best* answer among close alternatives. The AP MC questions are not immune to this trouble, but they resolve it as well as do most college MC tests.

The AP tests available for review seem reasonably well aligned with the College Board’s curriculum and with each of several, quite different working syllabi examined. This is so despite divergent views of the teachers who wrote those syllabi about whether AP Biology should be taught top-down (ecosystems, populations, and organisms first, chemistry last) or bottom-up (chemistry, biochemistry, and cells first, organisms and ecosystems last). The free-response questions are intelligently framed and fairly demanding.

IV. Conclusions

The rigor of the AP examination questions and of the underlying course content seems to me slightly less than one might encounter in questions from the final exam in an introductory course for biology majors in a research university. As such, AP Biology offers a slightly shallower coverage of the material than what students in that university course would receive. But as a match for the rigor of the average college biology course, AP Biology unquestionably succeeds.

Weighing content (curriculum design, descriptive materials for the subject matter, comprehensiveness of the latter, and the examinations aligned with it) at 60 percent, rigor (appropriateness of the intellectual level of the program) at 30 percent, and clarity (organization and presentation of the program) at 10 percent, I have assigned AP Biology the following grades:

Grades

Content (60%):A-
Rigor (30%):B
Clarity (10%):A

Overall Grade:A-

¹ The latter is concerned mainly, if not exclusively, with regulatory genes and gene expression as those influence embryogenesis and consequent changes in animal body plan, especially as those changes have affected the history of life. This shift, which reflects exponential growth of the above-named research fields (and of course of evolutionary biology in general), has already found its way into the introductory courses of some of the strongest departments, although not quite yet into textbooks. Neither heredity nor evolution is today conceptually distinct from molecules and cells except as the latter are treated in a purely descriptive way.

Advanced Placement Calculus AB

By Chester E. Finn, Jr.* · Martin A. Davis, Jr. · Sheila Byrd

I. Documents Reviewed

- ★ *Calculus: Calculus AB Calculus BC Course Description*, 2005
(www.collegeboard.com/student/testing/ap/sub_calab.html)
- ★ *Teacher's Guide: AP Calculus*, College Entrance Examination Board, 1997
- ★ *2003 AP Calculus AB and AP Calculus BC, Released Exams*, College Entrance Examination Board, 1999 and 2005
- ★ *AP Calculus AB Free-Response Questions, AP Calculus AB Free-Response Questions, Form B, AP Calculus AB Scoring Guidelines, AP Calculus AB Scoring Guidelines, Form B* for the years 2004, 2005, 2006
- ★ Four sample syllabi used by Calculus AB classroom teachers provided by the College Board

II. Introduction

The College Board has established two AP Calculus courses, Calculus AB and Calculus BC, and recommends that both be taught as college-level courses. Calculus AB is designed to correspond to two-thirds of a year-long college calculus course or course sequence, and Calculus BC is designed to substitute for a full year of college calculus.

Because the task of these reviews is to determine the extent to which AP and IB courses represent a “gold standard” for all American high school students, the focus here is on Calculus AB, and only Calculus AB receives a grade. Some discussion of Calculus BC appears, however, in order to place the AB course, including its strengths and weaknesses, in a broader context.

Each college and university sets its own AP credit and placement policies, but many institutions offer at least a semester of credit for high grades on the AB exam, and a year of credit for high scores on the BC exam.



III. Content

A. Course Description

The AP Calculus curriculum has noteworthy strengths. One is the course's emphasis on the definite integral as a limit of Riemann sums to counter the tendency of students to think of integrals only as antiderivatives. The explicit inclusion of the Mean Value Theorem along with geometric consequences (in both AB and BC) is also commendable, given the theorem's theoretical importance in calculus. Also of value for students who will apply calculus to scientific and engineering problems is the focus on using the correct terminology and units to answer word problems. The value is twofold: it helps students to understand the meanings of word problems, and it helps them communicate their solutions to others.

This is all well and good, but a closer examination reveals that the AP Calculus program suffers from some academic deficiencies and one very large philosophical problem. These follow.

* The authors benefited greatly from an expert review of the AP Calculus program by David Klein, professor of mathematics at California State University, Northridge, who served as consultant to this project, as well as from the insights of several other leading mathematicians.

De-emphasis of Analytic Methods

The *Teacher's Guide* recommends that “students be comfortable using machines to solve problems, experiment, interpret results, and verify conclusions.” Therefore, it’s recommended that students use technology “at all times,” except when taking certain “no-calculator” assessments.

This stems from the College Board’s belief that the study of calculus should “emphasize a multirepresentational approach ... with concepts, results, and problems being expressed geometrically, numerically, analytically, and verbally.”

Working with functions geometrically, numerically, analytically, and verbally, and understanding the interconnections among these ways of working, is the first listed goal of AP Calculus and is referred to as “the rule of four.” The *Teacher's Guide* describes this rule as a “rallying cry for the calculus reform movement,” in contrast to “the earlier paradigm of doing almost everything analytically.”

Of the categories of the “rule of four,” analytic methods receive the least emphasis in the *Teacher's Guide*. The difficulty with this approach is apparent when one examines how the curriculum treats the topic “computation of derivatives,” for example, which calls for the ability to compute derivatives of standard functions, along with knowledge of the chain rule and the rules for finding derivatives of sums, differences, products, and quotients of functions.

The *Guide* places computation of derivatives at the end of the list of topics, and explains why, thusly: Perhaps the most significant thing about this topic [computation of derivatives] is that it is listed last, “consistent with the philosophy that the emphasis of the course is not on manipulation.”

Logarithmic differentiation is another victim of this approach; it is no longer on the list of AP Calculus topics, in spite of being a standard part of mainstream university calculus courses. Practice with logarithmic differentiation helps to develop technical fluency in computations involving logarithms and exponentials, and it should be included in the curriculum.

Definition and Computation of Limits

The mathematical definition of limit is not part of the AP Calculus framework. The reason, according to the *Teacher's Guide*, is that it’s too hard:

Epsilons and deltas are gone from BC, and should not be missed by anyone embracing the goals of the course. (Their most apparent effect on student understanding in the first calculus course in the past, even in college, has been for some students to understand that they had better drop the course. After that, what will the *second* week be like?)

Difficulty is not a good reason to avoid the subject matter. Not all first-year college and university calculus courses include the definition of limit, and those that do vary in their depth of treatment. However, there are sound reasons for including it. Students who continue their studies as math majors benefit from an early exposure (revisited in depth in later courses) to a precise definition of this fundamental concept. Inclusion of precise definitions is the first step in recognizing that calculus *can* be developed rigorously with proofs.

Of the four representative course syllabi provided by the College Board and examined here, only one went beyond the AP Calculus framework by including the definition of limit as an optional topic.

Inverse Function Theorem

The Inverse Function Theorem, once a recommended part of the AP Calculus outline, now appears in a weaker form: “The derivative of an inverse function,” notes the *Teacher's Guide*, “has always been in the course description, but note here that the course description specifies the ‘use of implicit differentiation’ to discover the derivative, as opposed to the bottom-line rule found in the Inverse Function Theorem. This is consistent with the philosophy that the course should focus on broad concepts and methods rather than on the memorization of formulas or theorems.”

Using implicit differentiation to find the derivative of an inverse function is a valuable exercise, but the Inverse Function Theorem goes beyond this calculation by guaranteeing the differentiability of the inverse function. Science courses make regular use of its conclusion, rendering it useful for students to know. Furthermore, the Inverse Function Theorem for functions of one real variable has important generalizations to higher dimensions in later courses, and deserves a place in the curriculum for that reason alone.¹

Applications of Integrals and Antiderivatives

Some standard applications of Riemann sums and integrals, such as calculating work done by a force applied through a displacement, or calculating volumes using cylindrical shells, are not part of the recommended AP Calculus AB curriculum. Instead the goal is to teach modeling more generally so that students can apply their understanding of Riemann sums to a broad range of problems. The *Teacher's Guide* explains that “there might well be a problem on the AP Examination that starts by defining work as force times displacement, then proceeds to a point where . . . students could be expected to write the integral for themselves.” However, in looking through released test questions and sample questions from the *Course Description*, we found no such examples, and there is a sameness to the problem types. Typical problems involve a necessarily artificial variable rate (for example, rates of traffic, sand, fuel, or water flow) that the examinee is expected to integrate with respect to time in order to find a net accumulation.

The BC curriculum takes the opposite approach by requiring specific knowledge of the logistic differential equation, and using that particular equation in modeling problems on the Calculus BC exam. This is not a standard topic in many college and university first-year calculus courses, but it appears with regularity on the Calculus BC exams that we examined.

The AP Calculus curriculum would achieve a better fit with college programs by reversing these choices. That is, it should not specify particular differential equations to be analyzed at the BC level, and it should require more standard and important applications of the integral at the AB level.

Techniques of Integration

The integration techniques taught in AP Calculus AB are now limited to two: antiderivatives of basic functions and antiderivatives through simple substitution (including change of limits of integration). Integration by parts is a BC topic, and there exposure to partial fractions is limited to the case of nonrepeating linear factors, just enough to handle the logistic differential equation. The *Teacher's Guide* explains that “the impetus for this change stems ultimately from technology, but that is only because calculators are more dramatic than integral tables in replacing the need for this skill.”

B. Assessments

The duration of each AB and BC calculus examination is three hours and fifteen minutes. Section I of each exam consists of multiple-choice questions, and Section II consists of free-response questions. Each section is weighted equally for grading. Each is also further divided into a Part A and a Part B.

Part A of Section I has twenty-eight multiple choice questions to be completed in fifty-five minutes, and does not allow students to use calculators. Part B of Section I requires a graphing calculator and consists of seventeen questions to be completed in fifty minutes.

Each part of Section II lasts forty-five minutes, and each consists of three free-response problems. Calculators are allowed only for Part A. During the time allotted for Part B, students may continue to work on Part A questions, but without a calculator.

Not all of the questions in the parts of the test that allow calculators necessarily require their use, but some do. The AP Calculus exams require the use of graphing calculators that can at minimum graph functions within an arbitrary viewing window, numerically calculate derivatives and definite integrals, and find roots of functions. The exams also allow calculators with Computer Algebra Systems (CAS) that can symbolically calculate limits, derivatives, and integrals. For the sake of equity, however, the exam questions are purpose-



fully crafted to avoid giving advantage to examinees with these more powerful machines. For example, students are asked only to find definite integrals with numerical answers, and not indefinite integrals, in those parts of the AB and BC exams that allow calculators. In this way calculators with CAS provide no direct advantage. Here and elsewhere, technology determines mathematical content, a negative feature.

IV. Conclusions

The Calculus AB curriculum is clearly written with little ambiguity. The exams are well crafted and closely aligned to the curriculum. They appear to be effective in measuring the prescribed content. However, that content leaves much to be desired.

The program's over-use of calculators leads to some troubling distortions in its content emphasis. Two of the four parts of each AP Calculus examination require the use of graphing calculators. It is not then surprising that the mathematical content and the development of mathematical reasoning within the curriculum are strongly influenced by that technology. One negative consequence is a de-emphasis of analytical skills and important parts of mathematical reasoning.

The AP Calculus curriculum emphasizes "real world" applications through the use of technology, but not enough attention is given to the structural organization by which parts of calculus are connected to each other. The AP Calculus curriculum partially fulfills the obligation to teach these connections, e.g., by using the Mean Value Theorem to develop relationships between the graphs of a function and its first and second derivatives, and by using the definite integral as a limit of Riemann sums, as already noted. But definitions and proofs are largely swept aside.

There are obvious restrictions to what can be accomplished along these lines in AP's introductory calculus course, but some opportunities avail themselves. For example, a proof that differentiability at a point implies continuity at that point is accessible at this level, along with basic limit proofs and derivation of the derivative formulas for trigonometric and other functions. Even the Mean Value Theorem could be more fully exploited within the curriculum by asking for its use in proving the Fundamental Theorem of Calculus, and the Mean Value Theorem for Integrals. Of course, AP Calculus teachers are free to include all this material in their own syllabi. But they are also free not to. Whether they do or not, their students will not see questions about such topics on the AP Calculus exams.

In spite of its shortcomings, the Calculus AB program has some positive features, as identified in this report. Nevertheless, university calculus courses generally provide a better foundation for students who will continue their studies in the mathematical sciences than that offered by AP Calculus.

★ Grades

Content (60%):C

Rigor (Mathematical Reasoning) (30%):C

Clarity (10%):B

Overall Grade:C+

¹ To its credit, the Calculus AB exam does call upon students to find derivatives of inverse functions without first prompting the use of implicit differentiation. The following is a released exam question from the 2003 Calculus AB test, Section I, Part A: Let f be the function defined by $f(x) = x^3 + x$. If $g(x) = f^{-1}(x)$ and $g(2) = 1$, what is the value of $g'(2)$? The question is followed by five choices for the correct answer. Many university calculus instructors would feel gratified if their own students were able to answer such a question correctly, as would many high school Calculus AB teachers. For the 2003 Calculus AB exam, only 18 percent of the test-takers correctly answered this question – a rate slightly worse than expected for random guessing. Moreover, it was answered correctly by fewer than half of the students who received the highest possible grade of 5 for the exam as a whole. Certainly it is desirable and even necessary for an exam of this type to include difficult questions, but results for this topic might be improved if the Inverse Function Theorem were an explicit part of the syllabus.

Advanced Placement English Literature & Composition

By Sheila Byrd

I. Documents Reviewed

- ★ *AP English Literature and Composition Course Description*, May 2007, May 2008 (www.collegeboard.com/student/testing/ap/sub_englit.html?englit)
- ★ *Teacher's Guide, AP Literature and Composition*, 1999; a new *Teacher's Guide* is available at www.apcentral.collegeboard.com/apc/members/repository/ap07_englit_teachersguide.pdf. Registration at AP Central website is required, but free.
- ★ *AP English Literature and Composition Released Exam*, College Entrance Examination Board, 1999 and 2004
- ★ Sample AP English Literature and Composition syllabi (contained in *Teacher's Guide*). Other sample syllabi are available at www.apcentral.collegeboard.com/apc/members/courses/syllabi/index.html. Registration at AP Central website is required, but free.
- ★ *Free-Response Questions, Form B Questions, Scoring Guidelines*, 2004–2006

II. Introduction

Like all AP courses, AP English Literature and Composition is designed to represent the content in introductory English courses at the college or university level. According to the *Teacher's Guide*, AP English Literature and Composition “engages students in the careful reading and critical analysis of imaginative literature. Through the close reading of selected texts, students deepen their understanding of the ways writers use language to provide both meaning and pleasure for their readers.” Specific attention is paid to a work’s “structure, style and themes, as well as such smaller scale elements as the use of figurative language, imagery, symbolism and tone.”

Three cheers for the goals! But is this course a “gold standard”? Is it, in other words, one that teaches exiting U.S. high school students the essential skills of literary analysis and analytical writing they need for college and later life? Will it give them a deep appreciation for the enduring works of world literature? To find out, we chose to review this “culminating” English literature course, which was taken by over 260,000 students in 2006 and is the second most commonly administered AP exam after AP U.S History.¹



III. Content

A. Course Description

The AP English Literature and Composition *Course Description* contains a broadly worded discussion of the course goals, followed by a list of “representative authors” indicating “the range and quality of reading expected in the course.”

Teachers new to the AP program might reasonably wonder what specific content and skills are to be addressed in this course. To find out, they’ll have to muddle through the many wordy (but potentially helpful) curricular resources provided by the College Board. If they take the time to weed through these materials, they will likely be able to design a rich and rigorous course, one that will prepare students well for the AP exam.

The *Teacher's Guide* includes some important clues about the educational philosophy that informs the AP Literature and Composition course, such as a discussion of AP's arguably "formalist" approach to the writing it values:

"Although significant modifications have been made to the AP course and its exam over the years, both (and the exam in particular) continue to reflect the theory and resultant pedagogical strategies associated with a robust regard for textual authority—perhaps even the privileging of text over reader, as the emphasis is described by those who no longer embrace it."

This is an entirely sound, indeed courageous, stance in postmodern academia. The skills of literary analysis emphasized in both the curricular materials and the exam itself, the *Teacher's Guide* explains, prioritize students' ability "to understand, explain and evaluate a literary work. Such goals do not mean that students should never write a poem or present a personal opinion about a non-literary topic, but they do mean that the focus of the writing should be the text."

Terrific. But the obvious next question in determining the course's real rigor is: which texts, if any, does the AP value or prioritize?

Reading List

According to the *Course Description*, the course concentrates "on works of recognized literary merit." It then refers to the list of "representative" (not "required" or even "recommended") authors and suggests that "it is wisest to read the best books first." This representative list does include a fine sampling of distinguished authors, including a good representation of great American writers, whose importance is enduring. Students are to read works from "several genres and periods—from the sixteenth century to the twenty-first century." More importantly, they are expected to get to know a few works well. But apart from listing "representative" authors, the College Board offers no guidance about which are the "best books," nor about which ones a student should get to know well. To get this information, a teacher would have to spend considerable time reviewing old exams.

Organized by the genres of poetry, drama, fiction (short story and novel), and expository prose, the list is comprehensive, containing such estimable choices as Chaucer, Donne, Dickinson, Eliot, Frost, Heaney, Hughes, Yeats, Aeschylus, Shakespeare, Sophocles, Cather, Faulkner, Hardy, Hawthorne, Hurston, James, Twain, Boswell, Carlyle, and Mencken.

Notable among the missing are such important poets as Dante, Ovid, and Virgil.

A number of contemporary, though less talented, writers such as Toni Morrison and Bobbi Ann Mason also make the list, no doubt to fulfill the course's stated aim of introducing students to a variety of literary works from various centuries. That these writers are listed with the "best books" is questionable, however. The College Board should honor the best in contemporary literature, but writers such as Marilynne Robinson and Cormac McCarthy (whose novel *The Crossing* is sampled on one of the exams) would be better guideposts for quality.

A smart and experienced AP teacher would be sure, based on past exams, to expose his or her students to a sampling of *good* writers in various eras and genres. Less experienced teachers, not savvy enough to review past exams carefully, may well lead their students astray by referring only to the material in the *Course Description* and *Teacher's Guide*.

B. Assessments

Impressive in its scope, rigor, and the breadth of literature sampled, the AP English Literature and Composition exam is not just a useful indicator for teachers of the knowledge and skills that are important to AP examiners; it reflects the College Board’s expectation that students will receive rigorous training in literary analysis. The three-hour exam consists of fifty-five to sixty multiple choice (MC) questions (45 percent of the exam grade) for which students have sixty minutes. This section is followed by three essay questions, each allotted forty minutes (55 percent of the grade). The first two essay questions provide excerpts from literary works, and students are asked to respond to a text-related prompt. The third essay, the free-response question, asks students to consider a quotation or other observation about literature and to discuss that observation with specific reference to a work that they have studied.

The MC questions exhibit in places the same problems that many selected-response questions present for test-takers, particularly students who are highly intelligent, since more than one response could be considered correct. Still, the AP English Literature and Composition MC items do not display an excessive or disturbing pattern of ambiguous or misleading answer choices—a praiseworthy accomplishment for a literature exam.

A typical MC item follows (related to a poem by Elizabeth Bishop):

Between lines 24 and 25 and between lines 32 and 33, there is a shift from

1. understatement to hyperbole
2. realism to fantasy
3. optimism to pessimism
4. present events to recalled events
5. formal diction to informal diction

What makes this question sound is that it requires the examinee to not only read the text closely, but also have at his or her fingertips the requisite understanding of literary terms to answer the question. This level of rigor shows up consistently throughout the examples the College Board provides.

The essay questions are no less well designed. The first two questions probe students’ understanding of literary techniques by asking them to analyze supplied literary excerpts, as in the following example:

(Two poems presented)

The poems below are concerned with darkness and light. Read each poem carefully. Then, in a well-written essay, compare and contrast the poems, analyzing the significance of dark or night in each. In your essay, consider elements such as point of view, imagery and structure.



The texts associated with these essay questions are impressive, for the most part, based upon the exams reviewed. Excerpts came from, among others, Seamus Heaney, Cormac McCarthy, Henry David Thoreau, George Eliot, Emily Dickinson, Robert Frost, and William James.

The third question (the free response) tests how well students have mastered their own reading by asking them to cite books they’ve studied in response to a particular problem. A sample question follows:

The eighteenth-century British novelist Laurence Sterne wrote, “Nobody but he who has felt it, can conceive what a plaguing thing it is to have a man’s mind torn asunder by two projects of equal strength, both obstinately pulling in a contrary direction at the same time.”

From a novel or play, choose a character (not necessarily the protagonist) whose mind is pulled in conflicting directions by two compelling desires, ambitions, obligations or influences. Then, in a well-organized essay, identify each of the two conflicting forces and explain how this conflict within one character illuminates the meaning of the work as a whole. You may use one of the novels or plays listed below or another novel or play of similar literary quality.

Twenty-seven novels and plays are then listed, 80 percent of which could fairly be termed “classics.”

That the exams depend so heavily upon classical texts makes the College Board’s decision not to be more prescriptive in its reading list all the more confounding. The College Board does say in the *Curriculum Guide* that teachers should focus on the “best books.” Why not go a step further and spell out what those books are?

That the essays are timed has come under fire in some quarters, so the *Teachers Guide* defends the practice by reminding us that “the timed writing so many AP teachers require of their students is not exam practice; on the contrary, it is life practice,” and by asserting that while the layered, leisurely, and communal approach of traditional “process writing” is obviously useful and appropriate for a variety of situations, it is not appropriate for all. In education, in journalism, indeed in any situation where time is short and the writer’s ideas need to be given cogent expression, impromptu writing is the only possibility.

Employers and college instructors continue to be appalled by the woeful writing skills among many of their incoming employees and students. Writing a coherent literary analysis requires reason, discipline, and a cultivated appreciation of effective language (linked to a significant amount of close reading). It is to the College Board’s credit that they require such writing.

IV. Conclusions

The College Board could certainly make its expectations regarding AP English Literature and Composition easier to discern, but it plainly seeks to preserve the creativity of teachers by not prescribing a single course design. With that said, important content and skills are in fact implied or described in the *Course Description* (both in the narrative section and in sample exam questions). Careful consideration of the *Course Description* along with the *Teacher’s Guide* and the released exams should allow teachers to develop strong curricula.

On balance, this AP course reflects a fine standard for exiting high school students in the content area of English literature. Students who score well on this exam will have achieved far more than is typically required of exiting U.S. high school students, based on current state English standards.

Grades

Content (60%):B +
 Rigor (30%):A
 Clarity (10%):B-

Overall Grade:B +

¹ College Board Program Summary Report 2006, available at http://apcentral.collegeboard.com/apc/public/repository/ap06_prog_summary_rpt.pdf.

Advanced Placement U.S. History

By Sheldon Stern

I. Documents Reviewed

- ★ *U.S. History Course Description*, College Entrance Examination Board, 2005 (www.collegeboard.com/student/testing/ap/sub_ushist.html)
- ★ *Teacher's Guide: AP U.S. History*, College Entrance Examination Board and Educational Testing Service, 1997
- ★ *2003 AP U.S. History, Released Exams*, College Entrance Examination Board, 2005
- ★ *AP U.S. History Free-Response Questions, Form B, and Scoring Guidelines* for the years 2004, 2005, 2006

II. Introduction

The late Paul Gagnon, a longtime advocate of evenhanded, substantive history education for *all* students, believed that the study of American history was about more than increasing students' factual knowledge and improving their analytical skills. "Democracy's survival," he once wrote, "depends upon our opening to each new generation the political vision of liberty and equality that unites us as Americans."¹

The College Board's goals for students completing AP U.S. History are somewhat less ambitious, though still admirable. According to the *Course Description*, AP U.S. History "is designed to provide students with the analytical skills and factual knowledge necessary to deal critically with the problems and materials in U.S. History" and to prepare students for intermediate and advanced history classes at the university level.

To accomplish this, the course expects students to learn the skills of historical analysis (including how to assess historical materials and how to "weigh the evidence and interpretations presented in historical scholarship") and to reach conclusions based on informed judgment that they then defend in persuasive essays.

Teachers are free to structure their courses either in a traditional survey style (arranged chronologically) or thematically (arranged topically). The College Board favors the thematic approach, however, and arranges its materials in this fashion. Still, it recognizes the importance of chronology, and (as the *Course Description* explains) expects those who teach the course thematically to provide students with access to materials that give them "an overview of U.S. history and enable them to establish the context and significance of specialized interpretive problems."



III. Content

A. Course Description

The AP U.S. History *Course Description* organizes material around a set of "themes" or "unifying concepts." (As noted above, however, teachers are free to teach the course chronologically.) The twelve themes are listed alphabetically: American diversity, American identity, culture, demographic changes, economic transformations, environment, globalization, politics and citizenship, reform, religion, slavery and its legacies in North America, and war and diplomacy.

These themes are commonly found in today's college courses in U.S. history, but ironically, their only "unifying concept" would seem to be the celebration of diversity. For example, consider how the *Course Description* explains what the "culture" theme should cover: "Diverse individual and collective expressions through literature, art, philosophy, music, theater, and film throughout U.S. history. Culture and the dimensions of cultural conflict within American society." Or consider this description for the theme "reform": "Diverse movements focusing on a broad range of issues, including anti-slavery, education, labor, temperance, women's rights, civil rights, gay rights, war, public health, and government."

Many from one—“the diversity of the American people”; “recognizing regional differences”; “the roles of race, class, ethnicity, and gender”—rather than *e pluribus unum*—one from many—drives the AP U.S. History curriculum. Almost completely missing is the story of the origins of American liberty and equality, the common civic core that became our nation’s defining characteristic. A U.S. history course that fails to highlight this common civic core will barely touch on, or miss altogether, the most historic, far-reaching, and unifying political development in early America: the evolution of democratic bonds and cohesion from which a nation was ultimately forged with a shared and increasingly inclusive commitment to political freedom, democratic values, civic participation, and individual rights.

A common civic core is no threat to diversity. On the contrary. As Gagnon observed, a common civic core is indispensable for the success of a free *and* diverse society:

The past repeatedly proves that no sort of diversity is safe, or has a chance at equality, except among people with common democratic ideas.... Citizens of whatever class, race, age, gender, religion, or cultural taste need a common body of knowledge that gives them the power to talk to each other as equals.²

The diversity emphasis aside, another important question about the AP course is: How well do course materials inform teachers about the knowledge they’re expected to impart to their students? The College Board provides some guidance by specifying a list of topics, arranged chronologically for the most part, that teachers are supposed to use in conjunction with the course themes. But the list is so vague as to be substantively useless as a guide to teachers—especially those teachers with insufficient background in U.S. history.³

The outline for the entire period from pre-1492 to 1789, for example, includes only four extremely generic subject headings (“Pre-Columbian Societies,” “Transatlantic Encounters and Colonial Beginnings, 1492-1690,” “Colonial North America, 1690-1754,” and “The American Revolutionary Era, 1754-1789”). These four subject headings, in turn, subsume twenty-one historical subtopics. This might be fine if the subtopics referenced historically specific events. For the most part, they do not. They’re vague and overly broad, including such subtopics as “American Indian cultures of North America at the time of European contact,” “Resistance to Colonial authority: Bacon’s Rebellion, the Glorious Revolution, and the Pueblo Revolt,”⁴ “The War for Independence,” and “Population Growth and Immigration.”

By contrast, I have written a course outline for teacher preparation that has seventeen topic headings and dozens of historically specific subtopics to cover the period from pre-1492 to 1789.⁵ Among them are “African civilization and the Atlantic slave trade,” “European relations with Native Americans,” “Early settlement in New England,” “Colonial labor and the emergence of slavery,” “Africans in America,” “Origins of American political radicalism,” “Women and the family in British North America,” “The imperial crisis,” “Codifying liberty: the state constitutions,” and “Writing and ratifying the 1787 federal Constitution.” Teachers need this type of substantive and specific historical guidance instead of vague, open-ended generalities.

The College Board’s reluctance to prescribe content, much like the weakest standards evaluated in my 2003 Fordham Foundation study of U.S. history standards in 48 states and the District of Columbia,⁶ all but ensures that poorly prepared and less well-read teachers will fall back on personal politics and ideology when they cover material they don’t know very well—especially in the currently out-of-favor areas of political and military history.

But there is good news. Roughly three-fourths of the *Teacher’s Guide* is composed of eight sample course syllabi. These course outlines, created by teachers in public and private institutions and in secondary schools and colleges, are consistently comprehensive and demanding. Some are survey courses, such as the syllabus by Judy Cates, a teacher from Vista, California, which covers U.S. history in two semesters from the colonial period to the late twentieth century. Some are far more specialized, such as the one-semester course by Stanford University’s Jack Rakove, which covers the colonial era through the founding of the federal republic.

It remains the case, however, that there is little or no discernible connection or alignment between the depth and substance of these syllabi and the recommended themes and topics in the AP U.S. History *Course Description*. It seems reasonable to conclude that some innovative AP teachers are devising syllabi that are more thorough, and therefore more useful, than the College Board course description demands, but students in AP classes should not have to count on getting an inventive teacher. The course description itself ought to provide more detailed and substantive guidance in order to ensure consistency across classes throughout the country.

B. Assessments

The AP U.S. History exam begins with eighty multiple choice questions to be completed in fifty-five minutes. The questions are comprehensive and appropriately demanding. In a few cases, however, the choices can be confusing, especially for more knowledgeable students. According to the *Course Description*, for example, the “correct” answer to a question about the reason for Richard Nixon’s successful political comeback in 1968 is “dissension within the Democratic Party over Vietnam.” But another choice, “Nixon’s promise of immediate withdrawal of American forces from Vietnam,” is not really wrong. Nixon claimed to have a “secret plan” to end the war which many voters believed meant quickly bringing home U.S. troops.⁷

In addition to multiple choice questions, the AP U.S. History exam includes free-response essay questions that are demanding and content rich, more so than the *Course Description* indicates. These questions come in two parts. The first part requires students to answer questions using supplied source documents. For example, a 2004 document-based question asks, “In what ways did the French and Indian War (1754-63) alter the political, economic, and ideological relations between Britain and its American colonies?” Students are provided with pre-1754 and post-1763 maps of North America and six documents sampling American, British, and Native American perspectives on the war as context for answering the question. A 2006 document-based question asks, “Analyze developments from 1941 to 1949 that increased suspicion and tension between the United States and the Soviet Union.” Students are provided with samples of polling material, a political cartoon, and excerpts from six documentary sources.

In the second part of the free-response section, students are asked to choose two out of four standard (non-document-based) questions, requiring thirty-five minutes each of planning and writing time and counting for the remaining 55 percent of the free-response grade. These questions, too, are thoughtful, well constructed, and manageable within the allotted time frame. For example:

- ★ Analyze the impact of the American Revolution on both slavery and the status of women in the period from 1775 to 1800.
- ★ To what extent was the United States Constitution a radical departure from the Articles of Confederation? ★
- ★ In what ways did developments in transportation bring about economic and social change in the United States in the period 1820 to 1860?

The College Board scoring guidelines provide specific and detailed parameters for what should be included in these essays in order to achieve the highest score.

IV. Conclusions

It is clear that the AP U.S. History examination is a rigorous and fair assessment of important U.S. history topics. Unfortunately, one cannot discern the same level of rigor in the curricular materials provided to the teachers. The substantive sophistication of the free-response exam questions, much like the optional syllabi in the *Teacher’s Guide*, are clearly *not* derived from the content-challenged course outline or the often tendentious themes in the AP U.S. History *Course Description*. If teachers rely on these latter materials alone, their students cannot be assured of proper exposure to and exploration of the essential U.S. history content they’ll need to succeed. Therefore, the average grade for the College Board U.S. history course, balancing the shortcomings of the course outline and the “unifying themes” against the rigor and clarity of the exams and some syllabi is:

Grades

Historical Content (60%):B-
 Rigor (30%):B-
 Clarity (10%)B-

Overall Grade:B-

¹ Paul Gagnon, *Educating Democracy: State Standards to Ensure a Civic Core* (Washington, DC: Albert Shanker Institute, 2003), p. 7.
² *Ibid.*, p. 5.
³ See Diane Ravitch, “Who Prepares our History Teachers? Who Should Prepare our History Teachers?” *The History Teacher* 31, no. 4 (August 1998): 495-503. Ravitch found that more than half of U.S. high school history teachers did not major or even minor in history.
⁴ Why, readers might wonder, did the College Board choose the Pueblo Revolt, instead of King Phillip’s War, to represent Native American resistance to colonial authority?
⁵ Sheldon M. Stern, *Effective State Standards for U.S. History: A 2003 Report Card*, Thomas B. Fordham Foundation, 2003, at <http://www.edexcellence.net/institute/publication/publication.cfm?id=320>.
⁶ *Ibid.*
⁷ AP U.S. History Course Description, p. 27



International Baccalaureate: Biology SL

By Paul Gross

I. Documents Reviewed

- ★ *IBO Diploma Program Introduction*, International Baccalaureate Organization, Geneva
- ★ *IB Biology Curriculum Guide*, International Baccalaureate Organization, Geneva
- ★ IB External Examinations: Paper 1, Paper 2, Paper 3; markschemes for all examination papers, for each of three years, 2004 – 2006

Note: The IB does not make its materials available online.

II. Introduction

Most IB courses come in two flavors: standard level (SL) and higher level (HL). The distinction rests on the requisite number of teaching hours—240 for HL and 150 for SL. Suffice it to say that the relevant and adequate program level for a course that might serve for advanced placement—of a student from an American high school entering an American college or university—is SL, though it should be noted that the IB does not intend for its coursework to be tantamount to a first-year college course, as the AP does. Among the academic areas, group 4 is “experimental sciences,” and the IB Biology course of interest here is one of the group 4 alternatives.

Program design for IB Biology, as for the IB Diploma Programme as a whole, is elaborately specified. As we shall see, this is both blessing and curse—but mainly blessing. The *Curriculum Guide*, which is itself an outline, runs to 120 pages. The proceedings of an IB Biology course are as particular and densely detailed as might be expected from the style and design of the full program. The experimental science courses have no fewer than ten official aims, none of which will surprise a reader familiar with U.S. state science standards. Beyond the ten very general aims, group 4 courses have five objectives, each with several subheads.

Associated with the objectives is a set of fourteen action verbs, each of which specifies “the depth of treatment required for a given assessment statement. These verbs will be used in examination questions and so it is important that students are familiar with [their] definitions.” The full set of action verbs (including *annotate, calculate, compare, define, distinguish, draw, list, outline*, etc.) and their definitions are the connective tissue between the syllabus and the program’s meticulously planned assessment system. In IB science education, not much is left to chance or to the individual teacher.



III. Content

A. Course Description

The syllabus for IB Biology, seen broadly, is very much like the curriculum guide adopted by the College Board for AP Biology. Teaching and independent study opportunities are fashioned around five major topics:

- ★ Cells
- ★ The Chemistry of Life
- ★ Genetics
- ★ Ecology and Evolution
- ★ Human Health and Physiology

Beyond these, eight additional topics are available for study at a higher level (meaning in greater depth) by all IB students. These provide intensity that complements the breadth of the required core biology topics. The additions are: nucleic acids and proteins (effectively: molecular biology); cell respiration and photosynthesis (effectively: bioenergetics); genetics; human reproduction; defense against infectious disease (effectively: descriptive immunology); nerves, muscles, and movement (effectively: neurophysiology); excretion; and plant science (effectively: general plant physiology). If this set were truly up to date, it would include evolutionary genetics or molecular evolution, but so far it does not, at least not explicitly.

For each topic, core or additional, the program provides an exhaustive syllabus, in which every entry begins with one of the action verbs. The result is that a teacher or an entire IB school knows, in remarkable detail, the official expectations for teaching and learning introductory biology. This assures uniformity (1) of procedure and judgment, however distant the learners may be from the curriculum planners, and (2) of the “external” assessments. It brings the local teacher(s) under the exacting observation of IB planners and experts. It also ensures that the demands on students in the program will remain uniform from one year to the next.

The first topic, “Cells,” will serve us here as a sample of syllabus detail. Under Cells, there are three sub-heads: Cell Theory (1.1.), Prokaryotic Cells (1.2), and Eukaryotic Cells (1.3). Seven teaching hours are specified for all these. Each of the three subtopics then specifies a number of subdivisions. Cell Theory (1.1), for example, has twelve subdivisions (1.1.1 through 1.1.12), each structured as a sentence beginning with an action verb, which is followed by a brief but carefully written explanatory statement on what that action requires and the appropriate (point-creditable) results. So it continues through all five core topics. No requirement mandates that these topics be taught in the order or with the specific emphases of the curriculum guide, but it is clearly expected that everything will be covered at some time during the IB Biology experience. Everything touched upon in the syllabus is, moreover, liable to appear on an exam at the end. So far as clarity of purpose and program organization are concerned, IB Biology must be rated “excellent.”

The only downside to this very high level of specification is that for the best-prepared and most enthusiastic teachers of biology, and for schools with access to unusual life-science resources (e.g., a nearby arboretum, or the research laboratories of an international drug company, or a research institute), the expectations put something of a damper on curricular innovation.

B. Assessments

Participant success in an IB SL Biology course is measured by a linear combination of grades for two independent evaluations of accomplishment: the external assessment, a written test comprising multiple choice (MC) and short answers and worth 76 percent of the total, and an internal assessment directed mainly toward an interdisciplinary project carried out by the student, plus a number of shorter practical exercises (laboratory work). With rules of procedure, guidance, and oversight from IBO, this internal assessment is performed by the local teacher. It accounts for 24 percent of the final grade.

The external IB Biology assessment consists of three written “papers” (examinations). Paper 1 (forty-five minutes) is a rather elementary MC test of general knowledge of the core material. Many of the questions require either solving a problem implicit in the language of biology *or* simply knowing the definition and contexts for proper use of a word. For example (from the May 2006 exam, Paper 1):

25. *Plasmodium vivax* is one of the protozoans that causes malaria. Malaria kills over 2 million people each year. What is this protozoan?

A. A pathogen; B. An antigen; C. A fibrinogen; D. A mutagen.

Note that the issue of the relative importance of conceptual versus factual knowledge arises here. The test-taker cannot be sure of the answer unless he or she knows the definition of all four possible word-answers. It is a very good question; *but one cannot separate its conceptual content from the factual underpinning*. To their credit, the IB planners seem to be unapologetic about the need for factual understanding. Paper I contains some questions that refer to data and interpretation of their graphical forms.

In Paper 2 (seventy-five minutes), the test-taker is asked to analyze data and make judgments concerning the general state of a current subdiscipline of biology. Necessary data are provided on the test paper, often in extended and graphical form. This is a more sophisticated assessment than the MC questions of Paper 1. In section A, the test-taker responds with short answers to an inquiry that continues as a number of pointed questions about the meaning and utility of the data set being examined. In section B, the student is given a choice of free-response questions to answer, each with subquestions. These cover a wide enough range to ensure that most students will have encountered one or more of the issues in each question. Examples of subquestions for free response: “Outline the ethical issues of cloning humans.” “Explain how the rate of photosynthesis can be measured.” “Explain the role of hormones in the regulation of the menstrual cycle.” (Faced with these questions out of their context, a professional scientist might plan a short, well-illustrated book as response.)

Paper 3 (one hour) tests knowledge of two of the options (advanced topics) studied during the course. The required short answers include calculations (for which an electronic calculator is required). Questions are mostly data based and adequately searching. Successful short answers must be precise and sufficient.

Such tests as these, to be taken by students in many, and widely varying, school environments, can succeed only if the grading is intelligent, meticulous, and controlled for uniformity. For IB Biology (as for AP), this requirement is met via detailed “markschemes,” one for each of the three papers that comprise a full external assessment. These markschemes give not only the correct answers, but brief justifications for them when there is possible argument. Explicit instructions explain what will not be acceptable as a credit-worthy answer when there is the possibility of doubt. What results is a specified and well-characterized intellectual level of the expectations, and those expectations are concerned with the current content of biology, not with peripheral matters. The markschemes are well enough written and organized so that an external examiner of adequate background in biology (say, at least a recent college biology major) should find it easy to do the grading job in conformity with all others doing likewise, in any test year.

IV. Conclusions

I feel some sympathy for the lone teacher in an American high school undertaking to convert these regulations and details into a locally functional biology course, since they are much more detailed and rigorous than those described in U.S. state standards documents, which tend to be vague and nonrigorous. The IB course might serve as a gold standard for U.S. high school biology courses, if policymakers would agree to implement such a rigorous course of study, including its high-stakes system of formative and summative assessments.

I have assigned a lower grade for “clarity,” *not* because the official and recommended supporting texts are at all unclear—they are not!—but because the extreme systematization of the program and its documents might threaten to confuse, even to overwhelm, some of the teachers charged with mounting such a course, and in some cases to stifle curricular inventiveness or the exploitation of unique local resources. On the other hand, to the extent that the actual classroom science content of an IB biology course can be imagined solely on the basis of these documents, I have to award this program significant credit for coverage and rigor of the content.



Weighing content (curriculum design, descriptive materials for the subject matter, comprehensiveness of the latter, and the examinations aligned with it) at 60 percent, rigor (appropriateness of the intellectual level of the program) at 30 percent, and clarity (organization and presentation of the program) at 10 percent, I have assigned IB Biology the following grades:

Grades

Content (60%):A +
 Rigor (30%):A +
 Clarity (10%):C

Overall Grade:A

International Baccalaureate: Mathematics SL

By Chester E. Finn, Jr.* · Martin A. Davis, Jr. · Sheila Byrd

I. Documents Reviewed**

- ★ *Mathematics SL* (includes curriculum guide, internal and external assessment descriptions and criteria), International Baccalaureate Organization, Geneva, 2004
- ★ *Mathematics HL* (includes curriculum guide, internal and external assessment descriptions and criteria), International Baccalaureate Organization, Geneva, 2004
- ★ *Diploma Programme Mathematics SL Information Booklet*, International Baccalaureate Organization, Geneva, 2004
- ★ Two complete Mathematics SL past exams, Papers 1 and 2, and markschemes, May 2006
- ★ One complete Mathematics HL exam, Papers 1, 2, and 3, and markschemes, May 2006
- ★ Three Mathematics SL Type I (investigation) Portfolio project assignments, one student solution with teacher markings, 2006
- ★ Three Mathematics SL Type II (modeling) Portfolio project assignments, two student solutions with teacher markings, 2005, undated
- ★ *Vade Mecum 2007*, Section G, International Baccalaureate Organization, 2006

Note: The IB does not make its materials available online.

II. Introduction

★ Students in the IB Diploma Programme choose to enroll either in the Standard Level (SL) or Higher Level (HL) mathematics course. Mathematics SL, requiring 150 teaching hours, is designed for sixteen- to nineteen-year-old students who, according to IB literature, “expect to need a sound mathematical background as they prepare for future studies in subjects such as chemistry, economics, psychology and business administration.”

The more demanding Mathematics HL, requiring 240 hours, prepares students “expecting to include mathematics as a major component of their university studies, either as a subject in its own right or within courses such as physics, engineering and technology.”

The focus of this review is on Mathematics SL, although we discuss Mathematics HL for comparison purposes (and because there is some overlapping course material.)

* The authors benefited greatly from an expert review of the IB Math SL program by David Klein, professor of mathematics at California State University, Northridge, who served as consultant to this project, as well as from the insights of several other leading mathematicians.

**These are the documents the IBO supplied to us for review. Since then, a new edition of the Math guides has been introduced. Where appropriate, we provide footnotes that point out differences in the documents we reviewed and the new documents. Our overall conclusions were not affected.

III. Content

A. Course Description

The SL program offers exposure to a wide range of topics at both the high school level and at the beginning university level. The curriculum covers seven topics in the allotted 150 hours of class time:

Topic 1	.Algebra
Topic 2	.Functions and equations
Topic 3	.Circular functions and trigonometry
Topic 4	.Matrices
Topic 5	.Vectors
Topic 6	.Statistics and probability
Topic 7	.Calculus

Mathematics HL students study all these topics, but in greater depth and with a broader range of subtopics. HL students must also study all the subtopics in *one* of the following options:

Topic 8	.Statistics and probability
Topic 9	.Sets, relations and groups
Topic 10	.Series and differential equations
Topic 11	.Discrete mathematics

There are some advantages to this broad-stroke approach to math. Students are exposed to a large number of topics, and the SL syllabus ensures that important material is covered, such as the Binomial Theorem, arithmetic and geometric series, law of sines, properties of dot products of vectors, binomial and normal distributions, and expectations of discrete random variables.

Still, there's a considerable amount of material left unaddressed. For example, missing topics include an introduction to complex numbers, the reciprocal trigonometric functions (secant, cosecant, cotangent), and all of the inverse trigonometric functions. Identities for trigonometric functions evaluated at the sum of two angles are also absent, though double angle formulas are included. Because at the university level students' knowledge of these missing topics is normally assumed, these gaps in the SL curriculum constitute a serious deficit.

Also missing from the syllabi (and from the list of "Presumed Knowledge" that students entering the SL and HL courses are already expected to have) is a systematic development of synthetic geometry with proofs. In fact, the SL syllabus pays little attention to mathematical proofs in general. And the International Baccalaureate Organization says nothing about working with proofs in its list of aims and objectives for either Mathematics SL or HL. ★

The treatment of calculus in the SL course is also thin. The definition of limit is not included, and the definition of derivative is used only to establish the derivatives of polynomial functions; other functions' derivatives are "justified by graphical considerations using a GDC [graphic display calculator]." In particular, the derivative formulas for the three trigonometric functions studied in the course are used but evidently not derived. Missing, too, is any mention of the Mean Value Theorem or Riemann sums, though students use the Fundamental Theorem of Calculus. Riemann sums are needed to explain the meaning of definite integrals, and the Mean Value Theorem is the single most important theoretical tool for justifying standard problem-solving procedures in calculus. Implicit differentiation, a powerful analytical tool, is also absent.

Beyond these content issues is the problem of technology. Both of the IB math courses depend overmuch on calculators. The curriculum guide states, "Students are expected to have access to a graphic display calculator (GDC) at all times during the course." This is a disputable and, say many mathematicians, flawed approach. Dependence upon calculators reduces the odds that students will develop fluency in hand calculations, which is essential for following—or producing—some mathematical proofs, and for deriving scientific formulas in the mathematical sciences.

B. Assessments

A student enrolled in Mathematics SL is evaluated on the basis of a) an external examination created by the IBO and b) an internal portfolio consisting of two projects assigned and evaluated by the classroom teacher but moderated by the IBO.

The SL external exam constitutes 80 percent of the student's evaluation for the course and is made up of two parts, Paper 1 and Paper 2, weighted equally (the HL course includes a Paper 3). Paper 1 consists of fifteen short-answer questions, and Paper 2 is comprised of five extended-response questions.¹ Students are given ninety minutes for each paper, which may include questions about any part of the course syllabus. Students are required to have access to a graphing calculator.²

Students are not, however, required to remember formulas. Each examinee is provided with a clean copy of the *Mathematics SL Information Booklet* (or its HL counterpart). In it, students find four pages of formulas that they might need during the exams for Papers 1 and 2. Access to such a list of formulas for the external exams is a weakness if one believes, as we do, that students should be expected to understand these formulas and commit them to memory.

External Exams: Papers 1 and 2

Of the seven topics on the SL syllabus, “Statistics and probability” is perhaps most heavily emphasized on the external exams reviewed. Of the forty total questions from both SL tests (including Papers 1 and 2), nine were probability or statistics problems. There is little by way of standard high school algebra on the SL exams, except for linear algebra, which is well represented. Exam problems ask students to calculate dot products, norms, the vector from a given point to another point, equations of lines in terms of vectors, and closely related topics. The exams also include problems involving matrices and systems of two or three linear equations. However, students' demonstration of mastery of these subjects is compromised by their access to calculators during the exams.

Other problems do require some analytical skills, such as one that calls for the angular measure and radius of a sector of a circle, given a numerical length of arc subtending the angle, and given the numerical area of the sector. Problems in Paper 2 exams are broken into guided steps that also require a demonstration of some algebraic skills. (For the HL course, the difficulty of the questions on the Paper 3 exam for Topics 8 through 11, listed above, is pitched at a university level, and goes well beyond the normal high school fare.)

Overall, the external examinations for the SL course appear to represent the syllabus well (even though they tend to overemphasize statistics and probability), but many of the problems are calculator based, and there is relatively little assessment of the pencil-and-paper algebraic skills upon which much of a university curriculum depends.

Portfolio

A portfolio is required for both the SL and HL courses, and in each it constitutes 20 percent of a student's grade and ten hours of class time. Portfolio projects cover two types of tasks: mathematical investigation and mathematical modeling.

An example of a mathematical investigation project for the SL course is an investigation of powers of a two-by-two symmetric matrix. Students are given a list of tasks to complete, including numerical calculations for specific examples, finding a general formula for the n th power, and explaining why their general formula is correct.

The examples of mathematical modeling projects that we and our advisors examined require students to use the regression features of their calculators to find best-fit functions (polynomial or sinusoidal) for data that are provided, and then to use graphs to answer questions about the context for the data.

A detailed rubric is provided to teachers for evaluating the two projects. The rubrics for the SL and HL courses are the same, with a maximum of twenty-nine points available for each project, with six criteria for each of the two projects. The criteria for the mathematical investigation are:

Criterion A	Use of notation and terminology
Criterion B	Communication
Criterion C	Mathematical process—searching for patterns
Criterion D	Results—generalization
Criterion E	Use of technology
Criterion F	Quality of work

The criteria for the mathematical modeling project are the same except that for Criterion C, the phrase “searching for patterns” is replaced by “developing a model.” And Criterion D replaces “generalization” with “interpretation.” Criterion E, which involves use of technology, is graded on a three-point scale as follows:

- 0 The student uses a calculator or computer for only routine calculations.
- 1 The student attempts to use a calculator or computer in a manner that could enhance the development of the task.
- 2 The student makes limited use of a calculator or computer in a manner that enhances the development of the task.
- 3 The student makes full and resourceful use of a calculator or computer in a manner that significantly enhances the development of the task.

Full credit is evidently not available for projects of an algebraic or analytic nature that do not include the use of computing machines. Thus one might assume a student would not receive full credit for an SL mathematical investigation problem unless it included calculator investigations.

IV. Conclusions

The SL program is clearly laid out, and the syllabus and assessments are well aligned. Two strengths of the course are its breadth of coverage and focus on problem-solving skills. For those students not planning to take a math course in college, the curriculum is well chosen. It provides a glimpse into several parts of mathematics along with some practical skills, especially in the area of statistics.

On the other hand, if a student intends to take more math courses at the university level, it is not clear where that student should be placed. What university mathematics courses have as their prerequisites a small amount of calculus, but no exposure to complex numbers, almost no geometry, a spotty background in trigonometry, a smattering of linear algebra, and a good bit of statistics? Perhaps the answer is “more statistics courses.” The reliance on calculators and failure to require memorization of formulas puts students wanting to pursue math in college at a further disadvantage.

In fairness to the IBO program, highly motivated students and those most apt to take math in college follow the more rigorous HL syllabus. While notably more complete and mathematically advanced, some gaps exist even at this level. Still, students with the ability to complete such a demanding curriculum are likely able to fill in missing topics on their own.



Grades

Content (60%):	.B-
Rigor (Mathematical Reasoning) (30%):	.C
Clarity (10%):	.B

Overall Grade **.B-**

¹ Under the new guidelines, Paper 1 contains both short response and extended response questions. Likewise Paper 2.

² Under the new guidelines, students must have access to a Graphic Design Calculator only for Paper 2. Calculators are no longer permitted for Paper 1.

International Baccalaureate: Language A SL

By Carol Jago

I. Documents Reviewed

- ★ IB *Language A1 Curriculum Guide*, International Baccalaureate Organization, Geneva
- ★ Language A1 Standard Level exams and markschemes, 2004–2006
- ★ Prescribed Book List (PBL): A list of authors and works in the students' A1 language
- ★ Prescribed World Literature List (PWL): A list of authors and works originally written in a language different from the Language A1 and studied in translation

Note: The IB does not make its materials available online.

II. Introduction

In the best of all possible worlds, American high school students would both survey the vast collection of our nation's literature *and* read in depth, mastering the skills of literary analysis while developing an appreciation for the use of language. No one course can do both, and IB Literature is no exception. But for teaching students to appreciate literature and understand its complexities, few programs are better.

Students in the IB diploma program are required to take two language courses: Language A1 (first-language literature) and Language B1 (second-language literature and culture). Students who are fluent in more than one language may take more than one Language A course (i.e., Language A2).

The *Curriculum Guide* describes Language A1 as “a pre-university course in literature,” aimed at students “who intend to pursue literature, or related studies, at university, as well as at students whose formal study of literature will not continue beyond this level.” The former would normally follow the 240-teaching-hour Higher Level (HL) course of study, and the latter the 150-hour Standard Level (SL). Because this study is appraising the extent to which AP and IB courses represent a “gold standard” for all American high school students, this review is limited to Language A1 SL.

III. Course Content

A. Course Description

The Language A1 course does not aim to cover the history of U.S. literature, nor even the great works of world literature. Instead it aims—by demanding that students read extensively according to clearly established guidelines—to engage students “in independent literary criticism in a manner which reveals a personal response to literature.” For the IBO, “personal response to literature” entails critical analysis and supporting evidence.

The IBO has taken care to design the course so that students will read both widely and deeply. The course requires Language A1 SL students to read eleven books distributed over four parts (World literature—three books, Detailed Study—two books, Groups of Works—three books, and School's Free Choice—three books). The books for the first three parts are selected from two lists: the Prescribed Book List (PBL), which consists of works originally written in the Language A1 language, and the Prescribed World Literature List (PWL), common to all Language A1 courses, which consists of a wide variety of works categorized by language and genre. For the fourth category, School's Free Choice, teachers are permitted to select three works not on the PBL or PWL.

The book lists generally offer an excellent representation of countries, genres, and both classic and recognized contemporary authors. For example, the PBL for North America (Canada and the U.S.) includes Margaret Atwood, Robertson Davies, William Faulkner, F. Scott Fitzgerald, Nathaniel Hawthorne, Ernest Hemingway, Henry James, Edgar Allan Poe, John Steinbeck, Mark Twain, Edith Wharton, and Richard Wright. The PBL for Europe (United Kingdom and Ireland) includes William Blake, Elizabeth Browning, Robert Browning, Lord Byron, Geoffrey Chaucer, John Donne, Seamus Heaney, Gerard Manley Hopkins, John Keats, John Milton, Wilfred Owen, Isaac Rosenberg, Siegfried Sassoon, William Shakespeare, William Wordsworth, and William Butler Yeats.

Representation of Asian authors is weak, consisting only of N. C. Chaudhuri and Vikram Seth. Instructors have the option of including such writers among the free choice works, but such authors as Yukio Mishima, Haruki Murakami, Anita Desai, Rohinton Mistry, and Ha Jin would be good additions.

The Language A1 SL course requires that students read not only a variety of authors, but also, says the *Curriculum Guide*, “a range of literary works of different periods, genres, styles and contexts.” To accomplish this, the IBO requires that students read one work from each of three periods: pre-1800, 1800-1900, and post 1900. This is meant to ensure that students gain a historical perspective on literature, as well as the skills needed to read and interpret works written in a style (including diction) different from contemporary fiction, drama, and poetry. The drama guidelines require students to read a Shakespeare play along with related works of a different genre, and the poetry guidelines require students to read longer poems by poets such as Chaucer or Milton in conjunction with shorter poems by other writers.

The greatest downside to the Language A1 program for U.S. high school students is that unless they complete another course in American literature (Language A1 is taken in eleventh grade), they will be short-changed in their experience of their own nation’s literature. While teachers may use the “School’s Free Choice” unit of study to focus on American authors, they may also choose to overlook the subject. Even if they choose great American authors, however, this one unit cannot replace a complete survey course in American literature.

B. Assessments

IB Language A1 requires systematic formative and summative assessments, all of which are closely aligned to course aims, objectives, and the syllabus. A student’s final grade for the course is determined by performance on two written assessments: an “on-demand” exam (externally set and assessed by the IBO), and one essay of a thousand to fifteen-hundred words written during the course and externally assessed. Oral activities (internally assessed by the teacher and externally moderated by the IBO) are also required. The Language A1 exam includes no multiple choice items.



The first portion of the on-demand exam is 1.5 hours long and requires students to write a commentary on one of two previously unseen texts—one poem and one piece of prose. Students must demonstrate a clear understanding of each work’s theme, content, style, structure, and language. Guiding questions such as these are offered:

- ★ What is the impact of the poet’s use of metaphor and personification?
- ★ How does the poet use contrast to help convey meaning?

The *Curriculum Guide* explains that these questions are meant to aid students’ thinking. Students are not, however, required to address them in their commentary (i.e., they may choose other aspects of the work to explore). But to earn a high achievement level, the commentaries must be well developed, insightful, and coherently structured. Scorers assess student commentaries based upon five criteria:

- A. Understanding of the text
- B. Interpretation of the text
- C. Appreciation of literary features
- D. Presentation (includes organization and integration of supporting examples)
- E. Formal use of language

The second portion of the on-demand test, also ninety minutes, asks students to select one essay question from among several about drama, poetry, or prose and to answer with reference to literary works that they have studied. A sample question is:

Drama

1. *Either*

(a) Comparing the opening scenes of **at least two** plays, discuss what audience expectations are aroused and how.

Or

(b) “Drama explains individuals, not relationships.” Paying close attention to how individuals and relationships are presented in **two** or **three** plays you have studied, say how far you find this statement to be true.

Scorers assess these written papers based upon five criteria:

- A. Knowledge and understanding of works studied
- B. Response to the question
- C. Appreciation of literary features
- D. Presentation (includes organization and integration of supporting examples)
- E. Formal use of language

The final written requirement for completing the course is a comparative study (based on at least two of the three world literature works that students have read), focusing on a literary trait that links them. This essay is written during the course and submitted to IB Language A1 examiners for assessment. It demands analytical thinking and close reading. Students must bring to their answers a deep knowledge of particular works of literature as well as an understanding of how literature works.

Students who do not write often and well will not be able to succeed on the IB assessments. In order to perform well students will have to have had many opportunities to write about literature analytically—drafting, revising, and refining their work—with guidance from a teacher.

Oral communication is also valued within the Language A1 course. Oral performances are assessed by teachers in a process that follows a detailed grading outline supplied by the IBO. This process is as rigorous as that which is applied to the written commentaries. Students are judged on the correctness of their oral performance as well as the quality of their ideas.

IV. Conclusions

The IB Language A1 course approaches a “gold standard” for what an exiting American high school student should know and be able to do in the area of *literary analysis*, but not for what that student should know about U.S. literature.

While the curriculum and assessments prescribed by the IBO achieve their stated goal of helping students develop a “global perspective,” a U.S. high school student could complete this course of study without reading the core of great American literature—a troubling lacuna. This omission might be addressed by requiring that students enrolling in the IB Language A1 course also study the canon of American literature, either in the tenth grade or in another required eleventh- or twelfth-grade course.

Still, the course constitutes a specific, comprehensive, and demanding study of world literature. After completion of this course and an accompanying course in American literature, students are likely to be well prepared for the demands of the university, the workplace, and citizenship insofar as literature can achieve this.

Grades

Content (60%):B
 Rigor (30%):A
 Clarity (10%):A

Overall Grade:B+



International Baccalaureate: World History SL

By Lucien Ellington

I. Documents Reviewed

- ★ *IB History Guide* (includes curriculum guide, internal and external assessment descriptions and criteria), International Baccalaureate Organization, Geneva, 2001

Note: We reviewed the 2001 document, but a new document is slated to be used beginning in 2008.

- ★ Higher Level and Standard Level exams and markschemes, 2004–2006

Note: The IB does not make its materials available online.

II. Introduction

When it comes to understanding history, Aristotle had the right idea. “If you would understand anything,” he wrote, “observe its beginning and its development.”

The IB World History course adheres to half this idea. It spends a lot of time looking at the nineteenth- and twentieth-century development of our world. Unfortunately, it completely ignores what came before, including the historical roots of these centuries. It’s not a critical flaw in the program—the course matter is clearly delineated and very sound. But it is a problem for those who might want to view the IB World History course as a gold standard for U.S. schools and students.

The IB world history course, like other IB courses, includes standard- and higher-level “tracks.” Standard Level (SL) students must engage in the study of history for 150 hours and are required to examine in depth one prescribed subject from twentieth-century history. Higher Level (HL) students spend more time in the classroom (240 hours), but follow the same regimen as SL students with one exception: HL students must also spend time studying one of five additional “regional options” (Africa, Americas, East and Southeast Asia and Oceania, Europe including Russia/USSR, and South Asia and the Middle East, including North Africa).

★ Because the task of these reviews is to determine the extent to which AP and IB courses represent a “gold standard” for American high school students, this review focuses primarily on the history SL course. However, I also reviewed—but did not grade—the Americas option that HL students may take, seeking to determine if it could stand on its own as a good course in American history for all high school students.¹

III. Content

A. Course Descriptions

In IB World History, all students engage in an in-depth study of some of the most important history of the past century. They are required to choose one of three prescribed topics:

- ★ The USSR under Stalin, 1924-1941
- ★ The emergence of and development of the People’s Republic of China, 1946-1964
- ★ The Cold War, 1960-1979

Additionally, SL students are asked to study two or three twentieth-century world history themes from among six options (one of which should be related to the selected prescribed topic):

- ★ Causes, practices and effects of war
- ★ Nationalist and independence movements, decolonization and challenges facing new states
- ★ The rise and rule of single-party states
- ★ Peace and cooperation: International organizations and multiparty states
- ★ The Cold War
- ★ The state and its relationship with religion and minorities

I normally take a dim view of efforts to teach world history thematically. However, these themes are, for the most part, representative of some of the most significant trends of the past century. Moreover, they are well aligned to the prescribed topics and will serve to broaden students' knowledge of history outside their prescribed topic. For example, students who are studying "the emergence and development of the Peoples' Republic of China, 1946-1964" might also study "the rise and rule of single-party states." In so doing, they might be asked to compare and contrast single-party rule in pre-World War II Italy and Germany, and in the Soviet Union, with that under Chairman Mao Zedong. This exercise expands students' understanding of not only single-party states worldwide, but the single-party state in China, as well.

But IB World History doesn't stop there. Another impressive feature of the curriculum is that all students are expected to *do* history in ways that transcend learning facts or even comprehending historical events from one perspective. Students work with a number of primary and secondary materials from a variety of sources that reflect the viewpoint of different economic classes and genders, as well as national and ethnic perspectives and biases.

So far, so good. Yet despite my admiration for the in-depth historical work required of SL students, for the specificity and variety of assessment procedures, and for the substantive topics that students must address, the IB history content is far from the being a gold-standard world history course for U.S. high school students.

That's because the course, with its nearly exclusive emphasis on twentieth-century developments, includes the study of only a tiny fraction of the story of human civilization. Students at the Standard Level aren't afforded the opportunity to study in depth the history of even one *region*, such as Europe, Asia, or Africa (though HL students are).

If students—no matter how bright—have not taken a good "soup to nuts" world history survey course in high school before spending time in the IB's intensive twentieth-century curriculum, they won't have the breadth of knowledge necessary to understand major long-range developments in world history.

To cite just one example, belief systems rooted in antiquity and premodern times (religions and widely shared cultural assumptions) constitute a large part of the foundation for understanding twentieth-century colonialism, modern nation-states, and the intercultural interactions—economic, political, military, and social—of the past hundred years. If students haven't seriously engaged in the study of the Greco-Roman and Judaic-Christian heritage of the West, or the Confucian/Buddhist heritage of the East, they cannot possess the basic knowledge required for understanding these topics. This means that the IB course, in and of itself, is seriously incomplete. ★

B. Assessments

Both SL and HL students must complete a series of external (graded outside of class by IBO officials) and internal (graded by the teacher) assessments.

The external component at the Standard Level is a timed exam that consists of two test papers (three for HL students). Paper 1 lists four short-answer questions for each of the three prescribed twentieth-century topics. Drawing on supplied historical documents, students must answer all four questions in one topic area. Students writing on "the USSR under Stalin, 1924–1941," for example, would first read source materials (such as a short excerpt from a Stalin speech on industrialization, or a short extract from Gail Warshofsky Lapidus's book, *Women in Soviet Society: Equality, Development, and Social Change*). Then they would answer four questions that are similar in scope to this one:

- ★ With reference to their origin and purpose, assess the value and limitations of Source A and Source B for historians studying industrialization under Stalin.

Paper 2 gives students a choice of several extended response essays drawn from the six themes and asks them to answer two. These questions require students to display a command both of historical content and the complexities of twentieth-century topics. Thus, students writing on the topic “Causes, practices, and effects of war” address such challenges as these:

- ★ Compare and contrast the results of the First World War and the Second World War.
- ★ To what extent did technological developments ensure victory in twentieth century wars?

Higher-level students also must complete a Paper 3 and demonstrate in-depth knowledge of the region they studied by addressing economic, political, historical, and interregional issues.

The internal assessment, often referred to as an “historical investigation,” is a untimed essay of fifteen-hundred to two-thousand words. The International Baccalaureate Organization recommends that twenty hours of class time be dedicated to this project. This “investigation” is based on individual student interest in “specific historical enquiry tied to classroom activities.” Teachers provide feedback on topic selection and require students to submit drafts of their essays for comment and feedback. All papers must include an investigation plan, an evidence summary, a “sources evaluation,” an analysis, and a conclusion. Emphasis in grading is placed upon the student’s in-depth use of a few sources rather than superficial treatment of many sources.

All forms of assessments that I reviewed align well with the content and skills that students are expected to master, as described in the course guide/syllabus.

IV. Conclusions

The guide that I examined has first-rate content, and the assessment materials align nicely with the materials and skills for which they are designed. Students enrolled in the IB World History course not only learn some important twentieth-century history, but they also learn to think as historians. They must become comfortable with primary and secondary source materials, and learn to balance and weigh a wide variety of interpretations and opinions about the same event and then draw their own conclusions.

These skills will serve students well not only in later historical studies at the university level, but also in life.

- ★ If only the course did not limit itself to the twentieth-century. In so doing, the IBO is not only potentially denying students the opportunity to learn about the important cultures and civilizations that gave rise to our modern world; it’s hampering their ability to appreciate the complexity of twentieth-century (and, now, twenty-first-century) problems. One cannot fully appreciate Stalin, for example, without first understanding the history of authoritarianism and totalitarianism in Russia.

The course would also be improved if both SL and HL students were required to study one world region chronologically. Currently, only HL students do so.

Balancing these strengths and weaknesses, IB World History earns a B- as the gold standard world history course for the typical American high school student.

Grades

Content (60%):C
 Rigor (30%):A
 Clarity (10%):B

Overall Grade:B-

¹ Please see page 51 for a brief discussion of the “Americas” option for higher-level IB history students.

Is the IB “Americas” option suitable as an U.S. history course?

Higher Level (HL) students are expected to select one of the five regional options (Africa, Americas, East and Southeast Asia and Oceania, Europe including Russia/USSR, South Asia, and the Middle East, including North Africa). Content for the Americas option includes the United States, Latin America (including the Caribbean), and Canada. Could it stand alone as a U.S. history course?

This option does a respectable job of covering several important U.S. history topics—such as the Articles of Confederation, the Constitution, and the Civil War, as well as some seminal leaders, such as George Washington, Thomas Jefferson, and Abraham Lincoln. But because the course focuses on all of the Americas, it cannot cover all the U.S. material that an American student should learn. Among the people and topics important for the revolutionary and early political period, for example, and yet not included in the IB syllabus: Samuel Adams, Benjamin Franklin, the Boston Tea Party, Lexington and Concord, and the tensions between Jefferson’s and Hamilton’s visions of the country in the Washington administration.

Beyond this slighting of some important material, however, lies a bigger problem. It is not jingoistic to believe in American exceptionalism, or in the responsibility of U.S. schools to teach students not only about U.S. flaws, but also about what has made our nation a world success story. A good U.S. history course explains why large numbers of immigrants consistently want to come here, and what the basic values are that most Americans share. Certainly many policymakers and much of the public expect as much. But the broad scope of the Americas option all but ensures that any such discussion would be muted.

For students who have previously had a good survey course in U.S. history, the IB Americas option is an attractive course. Students can apply what they already know against the backdrop of the Americas at large, and further sharpen their understanding of our nation’s history. But if students lack this background, the Americas option offers, at best, a cursory survey of the highlights of our past.

In short, this option is neither detailed nor rich enough to serve as the sole course in U.S. history for American high school students.





THOMAS B. FORDHAM
INSTITUTE

1701 K Street, NW • Suite 1000 • Washington, D.C. 20006 • 202.223.5452 • 202.223.9226 Fax • www.edexcellence.net

*The Thomas B. Fordham Institute is neither connected with nor sponsored by Fordham University.
Copies of this report are available electronically or in hard copy by visiting our website, www.edexcellence.net/institute*