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2020 Vision Project Summary: FY99

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2020 Vision Project Summary: FY99

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ABSTRACT

During the 1998–99 school year, students from participating schools completed and submitted a variety of scenarios describing potential world and regional conditions in the year 2020 and their possible effect on U.S. national security. This report summarizes the students' views and describes trends observed over the course of the 2020 Vision project's four years.

Overall, the scenarios received in 1999 reflected not only more in-depth regional research, but also a greater understanding among the students of how to develop plausible scenarios for contrasting conditions. The students also better recognize potential implications for U.S. national security. Much of this change can be attributed both to the experience of continuing teachers and to the extended training teachers received.

A particularly interesting finding was the shift in student views of computer technology and U.S. relations with China. In 1996, most students viewed computer technology as highly beneficial to society, whereas in 1999, this technology was viewed with fear and suspicion, even personified as a malicious, uncontrollable being. Also in 1996, students tended to see U.S. relations with China as potentially positive, with economic interaction proving beneficial to both countries. By 1999, this view had shifted to a perception of China emerging as the United States' main rival and "enemy" in the global geopolitical realm.

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2020 Vision Project Summary: Fiscal Year 1999

Introduction

The Strategic Issues Thinking: *2020 Vision* project introduces students and teachers to national security issues and engages them in an interactive process of creating future scenarios relevant to the Department of Energy, Defense Programs (DOE/DP). Through a technique called scenario building, students provide DOE and Laboratory planners with an alternative, youthful perspective on national security, a perspective sometimes lacking in traditional strategic planning circles. The program's goals are to:

- obtain scenarios of plausible futures from young Americans from diverse backgrounds and geographic locations for use by the DOE and its Laboratories to better understand the national security issues concerning the younger generation
- provide an additional stimulation for broadening the plausible scenario spectrum for those in DOE and the Laboratories who are responsible for strategic planning
- introduce educators and students to national (and international) security issues through the art of scenario building

2020 Vision currently involves more than twenty teachers and several hundred high school students across the country.

Part 1: Summary of Student Papers

During the 1998-99 school year, students from participating schools completed and submitted a variety of scenarios describing potential world and regional conditions in the year 2020 and their possible effect on U.S. national security. The following sections offer general observations about the scenarios written during the 1998-99 school year, describe recurring themes, and compare and contrast FY99 results with previous years' results.

General Observations

The scenarios we received in 1999 reflected not only more in-depth regional research than we have seen in the past, but also a greater understanding among the students of how to develop plausible scenarios for contrasting conditions. Overall, the students also are beginning to better recognize potential implications for U.S. national security. Much of this change can be attributed both to the experience of continuing teachers and to the extended training teachers received at the summer teacher institute. The *2020 Vision* project team also provided additional resources for the teachers and students throughout the year. New viewgraphs and handouts, as well as the improved Web site, provided valuable assistance with assignments and research.

Focusing the students' initial research on specific countries prior to scenario development enhances the quality of the scenarios. Through this research, the students begin to recognize the cultural and political diversity of countries within major geographic regions. They also begin to understand the complexity of relationships not only among countries within a given geographic region, but also between those countries and the United States. The scenarios,

in general, reflected diverse viewpoints about the world and creative ideas about how specific countries might evolve over the next 20 years, as well as how world developments might affect U.S. national security.

As in years past, students tended to extrapolate current news events out into their scenarios. For example, many students focused on current "hot spots" around the world, such as Kosovo and Iraq (Saddam Hussein continues to appear in 2020), or current issues such as Y2K. More students this year were able to look beyond the headlines and envision a variety of general conditions that could affect U.S. national security in the next twenty years, such as an increasing proliferation of nuclear weapons or economic interdependence. Although one of the major benefits of *2020 Vision* is a heightened student awareness of current events around the world, the students continue to need encouragement to look beyond the headlines.

In general, this year's scenarios showed a greater tendency of the students to view the years 2000 and 2020 as points along a continuum, rather than as discrete beginning and endpoints of a story. We view this as a positive trend, indicating a greater depth of student thinking. Often, the scenarios did not "end," but described ongoing situations, in which the U.S. was in the middle of a decision. The students gave more consideration to how U.S. choices could affect the outcome of given situations and ultimately its own security—and the choices were not always clear-cut, right-or-wrong decisions.

Recurring Themes

In the classes that strictly followed the given model (see "Methodology" in Part 2), some interesting commonalities appeared in each quadrant (see Table 1). The students generally favored the "high security/world cooperation" world and found the "low security/isolationist" world to be the least desirable. For example, students proclaimed that in the high security/world cooperation quadrant, "The world is almost a perfect place, except for the high taxes," "Peace is easily achieved," and "With both of these on our side, we could control the world." Although they most often viewed government control of personal lives with disdain, scenarios describing little government control or regulation (the "low security" scenarios) almost always also described a more chaotic and dangerous society. One student summed up the tradeoff: "We are safer, but there are so many regulations on our daily life."

Several consistencies also can be noted in all quadrants. For example, the global economy strongly influences the U.S. economy—whether isolationist or not—and the United States' participation (or lack thereof) in that economy correlates with its own economic health (or lack thereof). Weapons of mass destruction play a role in conflict between nations in all quadrants, and countries that vex the U.S. include China, Russia, and nations of the Middle East (usually not specified). In all scenarios, oil appears as "the" resource, the control of which determines the economic well-being and power of nations.

Table 1. Common Themes in the Quadrants

High Security/Isolationist	High Security/World Cooperation
<p>Society:</p> <ul style="list-style-type: none"> • Government control of personal life high; trade-off between control and safety vs. personal freedom and privacy • Travel down and freedoms down • Internally safer, but threats from global problems could affect U.S. • Often, people unhappy—e.g., “choiceless, desolate lives”—but safer 	<p>Society:</p> <ul style="list-style-type: none"> • Government control of personal life high • Cures found for diseases (AIDS, cancer, Ebola), but this leads to overpopulation (possible solution is limits on family size) • Problem of homelessness solved • Everyone gets a good education and most people go to college
<p>Technology:</p> <ul style="list-style-type: none"> • Electric car • Less trade leads to innovation at home • Generally, however, not much advancement 	<p>Technology:</p> <ul style="list-style-type: none"> • U.S. is leader in technology, which creates many jobs; all countries linked by technology
<p>Economy:</p> <ul style="list-style-type: none"> • Generally, bad for U.S. • Unemployment up; companies move overseas • OR, manufacturing moves home, but labor is so expensive, prices rise and economy goes into recession • Oil prices increase, causing automobile industry to plummet • Asian economies fail, weakened by capitalism; U.S. economy declines 	<p>Economy:</p> <ul style="list-style-type: none"> • Global trade makes us vulnerable to other countries' economic actions, yet treaties/alliances help countries cooperate • Strong U.S. economy; trade is good • U.S. helps countries with weaker economies so that whole world is better off • World currency • Yet, economic inequality increases—more low-paying jobs that aren't very desirable
<p>Energy and Environment:</p> <ul style="list-style-type: none"> • Petroleum used, but alternative source had to be found; shale in Western U.S., but shale mining was an environmental disaster. 	<p>Energy and Environment:</p> <ul style="list-style-type: none"> • Biggest fear: cutoff of U.S. oil supply, but U.S. takes control of Middle East or U.S. stockpiles oil
<p>Politics/Government:</p> <ul style="list-style-type: none"> • U.S. defense spending up (along with taxes) • Militaristic society; military service mandatory • More police, yet more individual gun owners • Lots of money spent on school security; more surveillance, but it works • Civil War or revolution (internal conflict) • Dictator takes over 	<p>Politics/Government:</p> <ul style="list-style-type: none"> • Defense spending up • Strong U.S. defense prevents outside attacks • United Nations strong, although the country with the most power and money has the most votes and hence, control over final decisions
<p>International Relations:</p> <ul style="list-style-type: none"> • Less involvement in wars/conflict around the world; U.S. tired of intervention • Other countries feel abandoned or jealous of U.S.; more countries become unstable, which leads to more war throughout the world 	<p>International Relations:</p> <ul style="list-style-type: none"> • Other countries depend on aid from U.S. • Overall, safer world; everyone's happy • WWII, but eventually peace (except Bosnia); or WWII still raging • Terrorism down
<p>Weapons of Mass Destruction:</p> <ul style="list-style-type: none"> • Increasing nuclear weapon proliferation • Nuclear attack on Tel Aviv (by another Middle-Eastern country) • More support for antiballistic missile systems • U.S. returns to manufacturing and stockpiling nuclear weapons • Gas attack on NYC subway 	<p>Weapons of Mass Destruction:</p> <ul style="list-style-type: none"> • Terrorism down, but biochemical weapons sent from Korea to Kosovo • Revival of “Star Wars”

Continued

Table 1. Common Themes in the Quadrants (concluded)

Low Security/Isolationist	Low Security/World Cooperation
<p>Society:</p> <ul style="list-style-type: none"> • "Horrible country"—wants to leave • Mob and gang violence increase; more violence in general; U.S. is more dangerous place to live • Everyone owns a gun because the government can't protect individuals • Standard of living is down 	<p>Society:</p> <ul style="list-style-type: none"> • Family life nonexistent • Plagues • U.S. is not a safe place to live
<p>Technology:</p> <ul style="list-style-type: none"> • Technology not considered; other issues take precedence 	<p>Technology:</p> <ul style="list-style-type: none"> • Russia clones humans to form a billion-man army, which takes over U.S. • Global technology; many technological secrets have been stolen from U.S.
<p>Economy:</p> <ul style="list-style-type: none"> • Depression • End of middle class—only rich and poor • No involvement in foreign affairs leads to weak economy 	<p>Economy:</p> <ul style="list-style-type: none"> • Other countries run U.S. economy; U.S. depends on others for economic well-being • Trade is good; keeps everyone getting along • Foreigners are taking all the jobs
<p>Energy and Environment:</p> <ul style="list-style-type: none"> • When U.S. ends involvement in Iraq, Iraq takes over oil supply in Middle East 	<p>Energy and Environment:</p> <ul style="list-style-type: none"> • Gas and oil are scarce
<p>Politics/Government:</p> <ul style="list-style-type: none"> • Defense money shifted to pay for food and shelter for homeless (which ends up being the fate of all military personnel) • Sometimes, whole world also isolationist; sometimes only U.S., to its detriment 	<p>Politics/Government:</p> <ul style="list-style-type: none"> • Threat of anarchy
<p>International Relations:</p> <ul style="list-style-type: none"> • Other countries mad because U.S. withdraws assistance; no allies because we don't do anything for anyone else anymore • Low security leaves U.S. vulnerable to attack; war likely, terrorism up • OR, "If the U.S. stays out of the affairs of other countries, then nobody will want to invade the U.S." • China becomes dominant world power; sometimes bombs U.S. or cuts off trade • Borders closed 	<p>International Relations:</p> <ul style="list-style-type: none"> • Conflict with Russia and/or China; e.g., Russia takes over U.S., OR Russia and China form an alliance against U.S. they attack, completely destroying NYC, and they split the U.S. between them • "Our global participation has made us weak." In other words, U.S. global participation causes a low level of security • "World is about to end"
<p>Weapons of Mass Destruction:</p> <ul style="list-style-type: none"> • NYC destroyed by nuclear weapons from Middle Eastern countries 	<p>Weapons of Mass Destruction:</p> <ul style="list-style-type: none"> • Nuclear secrets China stole from Los Alamos help China defeat U.S.; China destroys U.S. with nuclear attacks

In the scenarios overall (including those not based strictly on the given model), several issues gained notable attention: weapons proliferation and warfare, technology, and the global economy. Issues involving U.S. relations with other countries also figured prominently. These issues are summarized below.

Trends in student scenarios from the beginning of the *2020 Vision* project are becoming apparent. Table 2 on pp. 15–16 compares and contrasts the recurring themes in this year's scenarios to those from the *2020 Vision* project's previous years, showing some of the issues that appear consistently and how the students treatment of them has changed or remained the same.

Weapons Proliferation and Warfare

Although many of the scenarios centered on wars, fewer students this year envisioned all-out WWII or “destruction of life as we know it” (although two or three students still used that type of phrase). More students looked at the potential for conflict in a more limited, regional context. More importantly, they usually gave plausible reasons for violence to erupt (e.g., Taiwan’s forced reunification with China, or conflict in Middle East over oil, or civil war in Mexico), rather than writing about one country attacking another for no reason.

The students almost always projected that U.S. national security would be affected by remote regional conflicts, but the U.S. did not always get involved. Sometimes, the scenario ended with a decision for the U.S. — get involved or not? In one scenario, the student weighs the alternatives of U.S. engagement (or not) in a conflict between China and Taiwan—and neither option holds promise of a positive outcome for the U.S.; the scenario ends with the questions, “What will be our consequences for becoming involved in such a sordid and complicated event?...Is it the United States’ moral duty to become involved?”

Students seldom mentioned terrorism or conflict between subnational military groups and national armies. Yet, those who envisioned armed conflict almost always assumed that weapons of mass destruction would be used. In one, consumer demand for fallout shelters skyrocketed as the threat of a nuclear attack on the U.S. increased. In another, a South American country developed a man-made virus for use in a bio-weapon. Several, however, envisioned limited use of chemical, biological, or nuclear weapons to achieve victory in “limited” conflict. The proliferation of weapons of mass destruction thus remains one of the biggest concerns among students. Others viewed economics becoming more important in deciding the outcome of conflict. Surprisingly, no one mentioned information warfare, which has been a prominent feature of past scenarios.

Even though warfare continues to be a principal theme, several students this year envisioned an end to conflict and a period of rebuilding (even in one that started out with World War III). Some also offered optimistic conclusions to their scenarios, creating a world in which cooperation among nations prevails.

Technology

Although some students mentioned advanced technologies such as solar power, electric cars, and medical cures to major diseases, most students writing about “technology” equated it with “computer technology.” They frequently borrowed concepts from movies like “The Matrix,” in which a computer could be plugged into a person’s brain through the back of his or her head. In this way, the person could be controlled by intelligent machines. Several scenarios focused on the brain-machine connection for both input and output. Others envisioned computers replacing humans in the work force, which leads to mass unemployment and social instability. Most striking is that most of the students viewed advancement in computer technology with suspicion and fear—they viewed themselves as having no control over the direction the technology takes or the role it plays in their own lives. The destruction of human

morality and dignity accompanies this "new age" and often results in social anarchy or complete control of people's personal lives a la "Big Brother." The students also tended to personify computer technology, viewing it as a living entity with malicious intent.

Even so, not all of the students wrote about computer technology in terms of doom and gloom. One scenario envisioned a professional "doctor" in home computers, which could diagnose and treat illness. In another, computers and the Internet were seen as a positive force for bringing people together in understanding and cooperation. But these were exceptions to otherwise negative perceptions of mind-controlling and society-destroying cybernetics.

One noteworthy example of technology (other than computers) solving a human problem appeared in a scenario about a global fresh water shortage (which itself caused conflict between nations). The students wrote, "The effort to find a solution to the world's water problem was solidified by the Water Wars of 2015 over the waters of the Nile, fought between Jordan, Egypt, India and other nations of this region. For the first time in history, it seems, all of the nations of the world have worked together with scientific community to find solutions to a problem." In this scenario, desalinization technology figures prominently as a means of solving the problem and bringing people together in cooperation.

Global Economy

The global economy appeared in this year's scenarios mainly in the context of the major players—and not even all of them: the U.S., China, Japan, and relatively few times, Europe. Japan is the main rival, either wresting the United States' #1 position or falling behind the U.S. after intense competition. Several students also mentioned the isolation of Japan wreaking havoc on the Japanese economy and/or the world economy.

Some students envisioned a "ripple effect" of events in one country or region of the world affecting the global economy. In one scenario, natural disasters in Mexico send thousands of migrants to the U.S., with a consequent impact on the U.S. economy. However, this ripple effect was not as prominent a feature as it has been in previous scenarios.

Regional and Country Issues

The students focused primarily on regions or countries that appear frequently in news headlines (e.g., China, Japan, the Middle East, and Russia). Yet, they also wrote about several countries in Central and South America (rather than South America as one large, politically unified region), such as Mexico, Guatemala, Cuba, Jamaica, Colombia, and Argentina. Several scenarios also look at European countries, both individually and collectively as a European Union. As in previous years, Africa appeared minimally, usually in the context of environmental degradation, civil strife, and disease. The students virtually ignored Canada and Australia (although one scenario about Canada really considers it as just an extension of the United States).

China. China represented the greatest potential future challenge to U.S. national security in the students' scenarios. In contrast to previous scenarios, however, China was seen exclusively as a rival to the U.S., rather than as a friend or trading partner.

Most students envisioned China's continued economic and military growth, including further industrialization and privatization. Most often in the scenarios, trade relations between the U.S. and China are strained, and its nuclear capability rivals that of the U.S., in large part due to the nuclear secrets stolen from Los Alamos. Several students imagined China using nuclear weapons against the United States. China's potential military strength sparks an alliance with Russia in several scenarios, and this alliance gives the two countries power enough to take over the U.S., divvying up the spoils between them. Several scenarios also feature conflict between China and Taiwan, sometimes including forced reunification. The students usually recognized the quandary in which this conflict places the United States.

Few students mentioned population problems within China. Some even saw the revocation of the "one child per family" law. Many students saw human rights violations continuing to cause trouble, with one or two scenarios describing civil war or revolution.

Japan. Japan appeared prominently in several scenarios, usually within the context of economic dominance in the world. Japan's development of advanced technology and sometimes a rebirth of militarism also appeared; one envisioned Japan's development and stockpiling of nuclear weapons. In another scenario, Japan replaces the U.S. as the world's economic superpower, and the U.S. is left to try to regain its former glory. The students tended to view both the U.S. and Japan, however, as vulnerable to each other's trade tactics. Trade was most often the weapon in a bloodless conflict.

Middle East. When looking at the Middle East, the students focused mainly on Iraq, which continued to appear as the main source of anti-American sentiment and conflict well into the 21st century. They usually still pictured Saddam Hussein at the helm, although in one scenario he is assassinated and in another, his son "Saddam III" takes over. Women's rights and a poor economy also feature in several scenarios. Oil continued to be the primary economic driver in the region, with various countries (usually Iraq) trying to gain monopolistic control of it. A few groups envisioned other issues and events in the Middle East, such as a religious war between Muslim Arabs and Israeli Jews.

Russia. When Russia appeared in this year's scenarios (which was not often), it almost always played a secondary role (e.g., in alliance with China against the U.S.). Few students considered Russia's internal affairs, but when they did, they universally saw a return to communism, although a more benign form of communism than that of the Soviet Union. Only one scenario envisions Russia's return to its former glory, in which it creates a new "Socialist Federation" with neighboring countries, which "SF" eventually dominates the world. For the most part, though, the students did not view Russia as becoming the kind of threat to the United States in the next 20 years that the Soviet Union was during the days of the Cold War.

South and Central America. As in previous years' scenarios, drugs remained a central theme in scenarios featuring South and Central America. Yet this year's students focused more on other social, economic, and environmental issues. For example, one group discussed the role of oil and its effect on the economy and politics of Colombia. Another envisioned the eventual demise of Fidel Castro and the subsequent democratization of Cuba.

Mexico played a much more prominent role in this year's scenarios than in previous years. In some, economic decline or natural disasters increased the pressure on the U.S./Mexican border, as Mexican refugees seek relief in the United States. Others describe pollution or disease migrating across the border from Mexico to the U.S. Several scenarios envision civil war in Mexico, usually initiated by conflict between the government (supported by drug lords) and an insurrectionist "people's" party. One envisions the defeat of the drug lords and a ensuing rise of Mexico as "a dominant world power." As always, trade appeared as a major issue, with the U.S. continuing to hold the upper hand.

Europe. As in previous years, the students developed some plausible scenarios for Europe, such as continued conflict in Bosnia, a more unified economic and military European Union (including implementation of the euro, a currency common to member nations), and a revival of Nazism ("neo-Nazism").

NATO was barely cited in the student scenarios, and when it was, it was primarily in the context of involvement with the U.S. in some remote regional conflict.

Other Issues

The social issues that drew the most attention in the student scenarios were related to health. On a positive note, several scenarios included cures for major diseases, such as AIDS, cancer, heart disease, and diabetes. Yet, several also imagined new viruses appearing as a result of rainforest depletion or malicious intent to create bioweapons. Genetic engineering also figured prominently in several scenarios.

The students paid much less attention to population problems than students have in the past. Although China still struggles with population problems in a few scenarios, many do not even mention population when talking about China, and one includes a revocation of the "one-child-per-family" law. Strikingly, none of the scenarios in any year considered population issues in India (whose numbers are rapidly closing in on China's), nor do they consider that the wealthy northern nations consume a greatly disproportionate share of the world's resources.

Concern about women's rights arose, but was not as prevalent as in years past. The issue showed up mostly in the setting of Muslim nations, but not in the United States. In fact, several scenarios included a female U.S. President. These features appear to signify an increasing feeling among students that women are achieving equity in the U.S.

Student coverage of environmental issues focused primarily on ozone depletion, destruction of the rainforests, and global warming. Some also mentioned air pollution and soil damage. Most reference to the environment was negative, although (as described above) one scenario projected initial conflict over water leading to worldwide technological cooperation.

Comparison and Contrast to Previous Scenarios

As the *2020 Vision* program continues, we can begin to see trends and interesting contrasts in student thinking about global issues and about U.S. national security, as shown in Table 2.

Table 2. Comparison and Contrast of Student Scenarios

1996	1997	1998	1999
Conflict and Cooperation*			
Dissolution of NATO or UN	NATO becomes pro-European peace	Little mention of NATO; UN gains strength	NATO in coalition w/U.S. in regional conflicts (still Bosnia); UN minimized
Some major conflict within the former Soviet Bloc countries	Former Soviet Bloc countries mentioned only in theme papers	Industrialization consolidates some Bloc countries, but conflict also	Some return of a Russian "Social Federation" of allied countries
Resolution of Israel/PLO conflict	Conflict between Israel and its neighbors	War/disputes between Israel and its neighbors	Unidentified neighbor nukes Israel; continuing disputes
Mexican-U.S. border patrol stronger in some cases, yet chastised in one for violence	Border patrol becomes stronger, sometimes leading to riots in border towns	U.S. takes over Mexico and Mexicans become U.S. citizens; no mention of border patrol	Civil war in Mexico; or, continuing immigration problems for U.S.
China has a massive civil war	China takes over not only Hong Kong, but also Taiwan and sometimes other Southeast Asian countries	China takes over Japan, Taiwan, or other Asian countries	Threat of forced China-Taiwan reunification or China takes over U.S. (often in alliance with Russia)
Weapon Proliferation			
Global disarmament a common theme	Proliferation and terrorism common, but virtually no mention of global disarmament	Some mention increased control of arms, but none envision complete disarmament	Few mention control of arms; assume proliferation and use of all three types of WMD
New Cold War	Russian "loose nukes"	No return to Cold War, but concern about "loose nukes"	New Cold War with China; no mention of "loose nukes"
Russia sells nukes to "rogue countries" such as Libya, Iraq, and Syria	Russia sells nukes to "rogue countries" in Middle East (such as Iraq)	Russia sells nukes via Internet to Middle Eastern countries and terrorists	China sells nuclear weapon technology to Iraq
Examples of nuclear terrorism	Rampant nuclear terrorism, including "pocket nukes"	Terrorism of all kinds	Less mention of terrorism; more often, overt conflict is featured
Resurrection of "Star Wars" (ballistic missile defense)	No mention of Star Wars	No mention of Star Wars	"Star Wars" or antiballistic missile defenses featured prominently.
Global Power Shifts			
China gains power and forms alliance with Russia	China becomes a dominant world power	China becomes major power. In one, forms alliance with Mexico	China becomes major power. Los Alamos spy case figures prominently
Sometimes Japan seen as contender for world power	Trade wars between Japan and U.S., but no military build-up	Japan is source of technology, but not world power	Japan is source of high-tech., becomes a superpower (usu. economic, sometimes military)
Dictator in Middle East rising with nuclear capabilities	Middle-Eastern tyrant takes over	Saddam Hussein takes over entire Middle East	Iraq (Saddam Hussein) prominent; takes over oil, develops WMD, etc.
Quebec secedes from Canada	Virtually no mention of Canada	No mention of Canada	Iraq attacks Canada; U.S. dragged in
In isolation, U.S. focuses more on domestic problems	Isolationism leads to U.S. decline OR benefit	Isolationism seen as mostly beneficial to U.S.	Isolationism seen as mostly detrimental to U.S.; global cooperation beneficial

*Note: in 1996 and 1997, students included conflict between England and Ireland in their scenarios, but not in 1998 or 1999. Also, Turkey and Greece appeared prominently in previous scenarios, but neither country was mentioned in the 1999 scenarios.

Continued

Table 2. Comparison and Contrast of Student Scenarios (concluded)

1996	1997	1998	1999
Technology			
Information Revolution leads to more jobs in the U.S.	Information-based society	Computer catastrophes due to Y2K; less benefit from Internet	Y2K reaction mixed: some disastrous, some minimal
Information Revolution leads to computer terrorism	Information Revolution leads to computer terrorism	Computers vulnerable, but no direct "computer terrorism"	Computer tech. personified, cannot be controlled; high level of fear
Society			
Population/human rights problems in China	Population/human rights problems in China	Human rights violations; some resolution of population problems in China	Resolution of population problems in China, problem is more global; some mention of human rights
Virtually no mention of Africa	Africa is a source of deadly diseases, chaos, ethnic/civil war	Minimal coverage of Africa	Africa's resources depleted, leading to environmental decline; disease up
Virtually no mention of South America	Drugs are biggest problem in South America	Drugs remain biggest problem in South America.	Drugs still problem, but individual countries covered; economics, society, and environment considered
First woman elected U.S. President (one scenario)	In some, Colin Powell or woman elected President	First woman elected President; students saw themselves elected President	Several envisioned women as President, sometimes specific women (e.g., Elizabeth Dole)
Improvement of public education in U.S.	Both improvement and decline; increased college enrollment	Virtually no mention of education in the U.S.	In good quadrants, high education
Media has negative effect on U.S. society	Media has negative effect on U.S. society	No mention of the media	Media only came into play in context of computer technology
Economics			
Strong European Union: common language, currency, and sometimes government	Mention of EU with common currency	Some mention of unified Europe (not much), but common currency (the Euro)	European Union strong; Euro is the common currency
Russia reverts to communism; rarely, it moves toward democracy or capitalism	Russia reverts to communism; sometimes achieves democracy and free-market system	Russia recovers economically and politically; rarely returns to communism	Russia usually returns to communism
Virtually no mention of South America	South America has problems with corrupt governments	More detailed, specific coverage of regional economics	Most countries experience economic depression; sometimes outlook is up
Depression hits the U.S.	Depression hits the U.S.	U.S. economic problems mild—inflation, trade deficits, sometimes national debt	U.S. economic problems tied to global economy; equal numbers of students saw either boom or depression
Energy and Environment			
World moves to clean energy source; electric and solar-powered cars	Alternative energy sources, as well as electric and solar automobiles	Alt. energy: solar, hydro., geothermal, space or ocean; also, political implications of new energy considered	Alternative energy: solar power, electric cars; oil still dominant energy source
	Acid rain, pollution, deforestation, ozone depletion; U.S. major cause, but few solutions to problems	Not as much mention of environment; concerned primarily about pollution, deforestation, ozone depletion	Global warming, destruction of rainforests and ozone layer; few solutions to problems

Although some groups of students moved toward the extremes of fatalism (“the world will end”) or idealism (“the world is a perfect place”), the majority of students envisioned a world somewhere in the middle. The scenarios generally showed a promising depth of student research and good use of critical thinking skills. Also, even though some of the students did not specifically address their scenarios’ implications for U.S. national security, almost all of the scenarios reflected an assumption that the United States will be increasingly affected by events around the world. The students also are beginning to see the effects of national security issues in their own lives.

Methodology

To develop their scenarios, the students used a quadripartite approach, which Sandia adapted from scenario planning techniques developed by the Global Business Network (GBN).** This method uses two sets of contrasting conditions, which are depicted as two crossing axes, with four possible future directions represented by the resulting quadrants. The axes used for *2020 Vision* in FY99 were “World Cooperation” and “Degree of Security” (see Fig. 1).

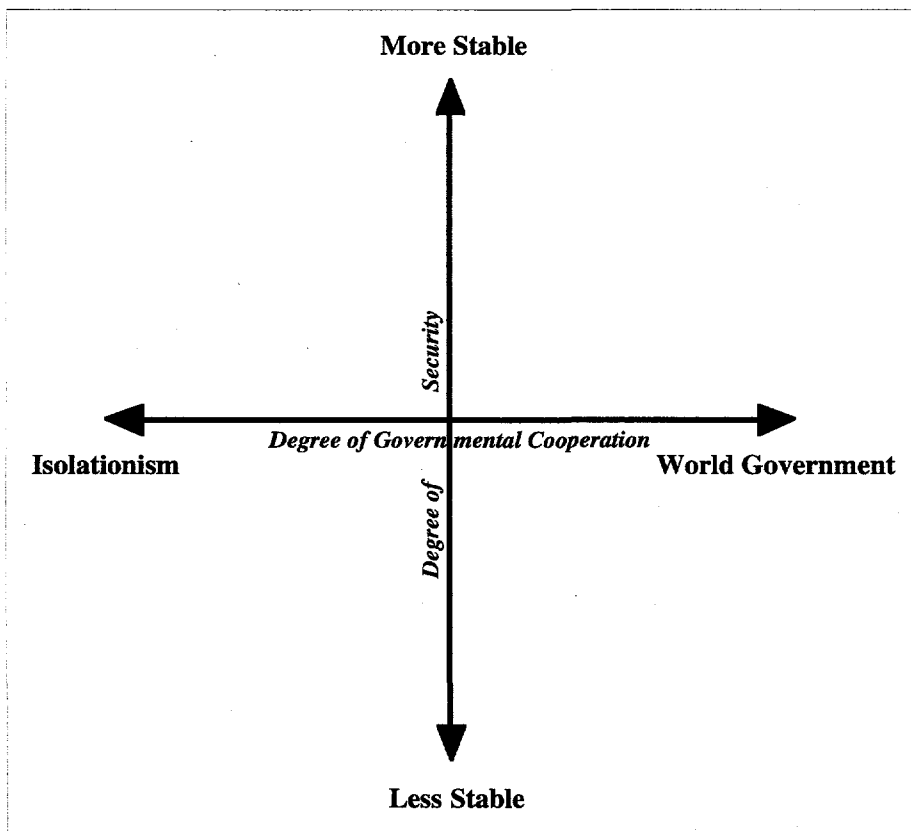


Figure 1. The axis model used for the 2020 Vision scenario building exercise during the 1998–99 school year.

**Global Business Network is a consulting firm located in Emeryville, California. GBN helps major companies and other organizations plan for the future using scenario building techniques.

At the beginning of the project, the students were divided into teams to complete background research on various regions of the world. This research focused on major topics—or “driving forces”—such as politics, economics, energy, environment, society, and science & technology. In some classes, the regional teams went on to write scenarios for their region based on the axis model. In others, the students were again divided into teams—at least one for each quadrant—and then wrote more general scenarios about potential world futures within each quadrant.

The *2020 Vision* project allows flexibility in how teachers implement the program in their classrooms. For example, teacher Elsie Scott at La Cueva High School first familiarized the students with the GBN model, allowing them to create scenarios based on axes of their choosing. She then had them conduct their regional research. For their final exam, they individually wrote scenarios based on the given axes. At Livermore High School, in addition to implementing the given project format, teacher Ron Nicola incorporated *2020 Vision* in his “Meeting of the Minds” activity, which he has conducted over the last five years. In this activity, one group of students is divided into teams representing at least a dozen different U.S. Presidents, and a second group of students is divided into six teams responsible for preparing possible scenarios of issues that may affect U.S. national security over the next 20 years. These issues are related to the driving forces used in the regional research. During an evening performance, each of the issue teams presented a future scenario to the “Presidents”, and each President told how he (or she) would respond. At the end of the evening, the audience voted on who they would elect for President.

In all cases, the students wrote scenarios for the year 2020. Some also wrote scenarios for the year 2000 as a starting point and 2010 to show the progression of events leading up to their scenarios of 2020. They then were asked to consider the implications of their scenarios for U.S. national security.

Part 2: FY99 Accomplishments

During FY99, the *2020 Vision* team met or exceeded all major goals for the year. We developed and implemented an online bulletin board through the revamped *2020 Vision* Web site (called "2020 Talk! Discussion Room"), piloted distant school participation and recruited additional distant schools to participate in the coming school year, hosted two mid-year conferences for students, further formalized the mentor program, and offered a week-long teacher institute similar to the successful institute held in summer 1998. We also introduced the program to several potential university participants, which we expect to enhance the future direction of *2020 Vision*. These accomplishments and future directions are discussed below.

The Online "Discussion Room" and *2020 Vision* Web Site

The online "Discussion Room" is the main vehicle for students to ask questions of *2020 Vision* mentors and to find out what students at other participating schools think about topics related to the program. It provides a free-flowing forum, which encourages wider interaction among students, as well as between students and mentors.

The *2020 Vision* Discussion Room experienced a flurry of activity during the spring semester as students conducted research for their papers. Participation by mentors also was high. Topics addressed in the Discussion Room include weapons of mass destruction, energy and environment, regional issues, technology, and terrorism. Some schools have experienced difficulties accessing the online discussion room, which can be attributed to several causes, such as security software on school servers, incorrect passwords, and heavy computer usage at the schools during peak periods. Most of the issues have been resolved, and we expect a much higher access rate in the coming year.

Besides adding the online Discussion Room, the Web design team completed the reorganization and redesign of the overall *2020 Vision* site early in the fiscal year. It includes an overview of the program, a list of participating schools, weekly summaries of current events around the world, and a *2020 Vision* news page, which lists newspaper articles about *2020 Vision* activities. The site also provides a resource library, which includes a bibliographic reference list of works related to the project and a list of Web sites to help students conduct their research.

The *2020 Vision* Web site continues to be an integral part of the project experience for both our neighboring schools and our distant participants. Teachers participating in the summer training institute attend a class to learn how to use the site so that they may share the site's valuable resources with their students. We will continue to improve the design of the site to incorporate new techniques for ease-of-use and accessibility and will monitor usage throughout the year.

Distance Learning and *2020 Vision*

During the 1998-99 school year, teachers and students from three high schools outside of California participated in *2020 Vision* for the first time: St. Pius High School and La Cueva

High School in Albuquerque, and Rancocas Valley Regional High School in Mt. Holly, New Jersey. In addition to the continuing teachers from these schools, teachers from three other distant schools will implement *2020 Vision* during the 1999–2000 school year. Participating in the 1999 summer institute were teachers from Sandia High School in Albuquerque, Hermantown High School in Minnesota, and Governor's School for Government and International Relations in Virginia, as well as several new teachers from California. We now have participants from states in all major regions of the country.

The first six distant teachers who implemented *2020 Vision* in their classrooms helped us pilot the online Discussion Room and troubleshoot technical issues. Rancocas Valley Regional High also videolinked to the student conference held at Sandia/California in April 1999 (see below). These venues provided the main link between the distant *2020 Vision* participants and the Sandia mentors. Although somewhat intimidated by the thought of interacting with highly educated scientists and engineers, the students found their communication with the mentors through all media to be enlightening and engaging. Not only did they learn about topics they were researching, but they also found the mentors easy to talk to and interested in their views.

The *2020 Vision* team also initiated an electronic newsletter for keeping teachers and mentors informed of program-related issues and events. The newsletter is distributed semi-monthly during the school year.

Student Conferences

During the 1998–99 school year, we hosted two student conferences; April 30, 1999, at Sandia/California, and May 17, 1999, at Sandia/New Mexico.

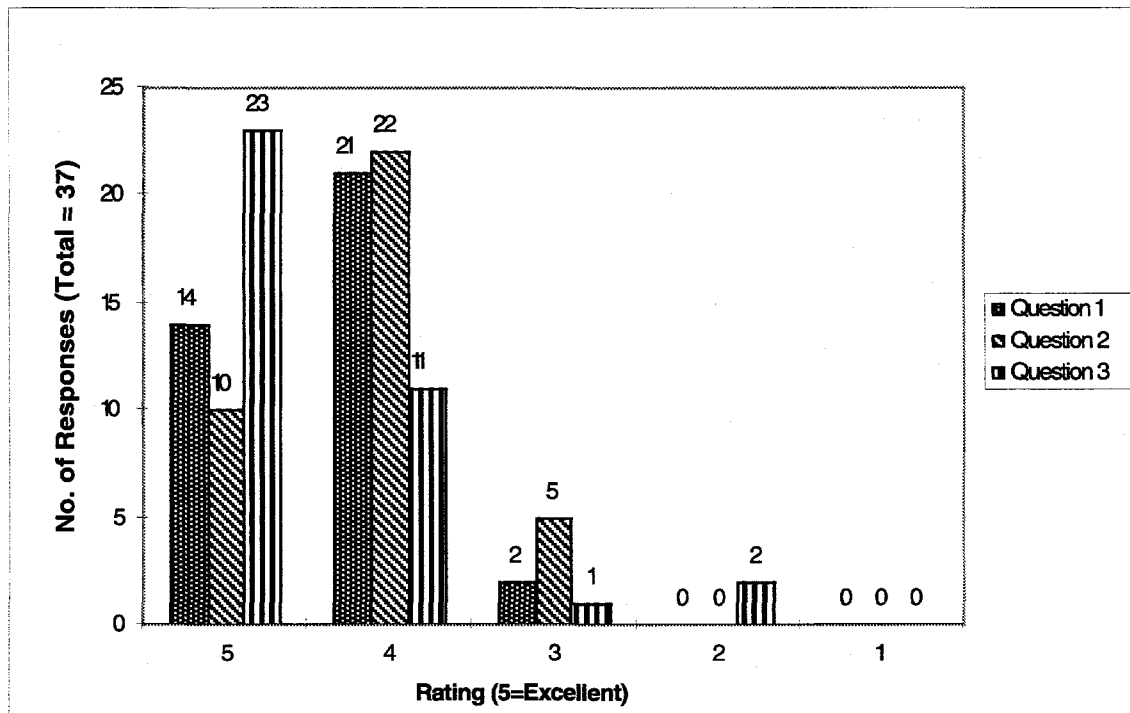
During the April conference, selected students from Livermore and Village high schools presented the results of their *2020 Vision* projects. All participants went on at least one of three tours of Sandia/California site facilities, including the Combustion Research Facility, the Visualization Design Facility, and the Extreme Ultraviolet Lithography laboratory.

The conference attendees participated in panel discussions with Sandia scientists and engineers who serve as *2020 Vision* mentors. In response to feedback from the 1998 student conference, we allowed time for all of the students to participate in all four panel sessions, which covered topics related to the *2020 Vision* project. However, rather than move the students among the conference rooms (with varied seating capacity), the students were assigned to one conference room, and the topical experts rotated among the conference rooms.

A unique feature of the conference was a live videolink to Rancocas Valley Regional High School in New Jersey. Through this link, the RVRHS students were able to participate in the morning welcome and introduction to *2020 Vision*, as well as three panel sessions.

Feedback from the students, teachers, and mentors indicated that the conference made a big impact on the students and is a valuable component of the *2020 Vision* program (see Fig. 2). Almost all participants rated the conference as "Excellent" or "Very Good" (numbers were split fairly evenly between the two). In response to the open-ended survey question ("Please tell us how we can make *2020 Vision* more helpful to you"), students' comments centered on wanting

more of everything—longer panel discussions, time for questions and answers after student presentations, more time for whole group discussions of issues relevant to *2020 Vision*, more conference time in general, and most emphatically, more time for more tours, as well as more hands-on tours. Several students said “It was perfect,” or “It was a great experience!” One student commented, “This project really gets you in touch with current issues in the world today that you weren’t aware of before. But now you watch the news and look for things that are happening that might affect you in the future.” The students particularly appreciated the personal attention and interaction with the Sandia mentors.



Question 1: How would you rate the morning panel discussions with mentors?
 Question 2: How would you rate the afternoon student presentations?
 Question 3: How would you rate your afternoon tour?

Figure 2. Rating of the Student Conference, April 1999.

The half-day student conference in New Mexico featured several student groups from St. Pius X High School presenting their scenarios created about Mexico. They had prepared PowerPoint slide presentations and appeared professional and poised in front of the audience. The students also had an opportunity to tour the Robotic Manufacturing Science and Engineering Laboratory and learn a bit about their neighbor Sandia.

Mentor Program

During the 1998–99 school year, Sandia scientists and engineers from around the Sandia/California site served as volunteer mentors to participating teachers and students through the online Discussion Room, as well as through panel discussions at the student

conference and the teacher institute. Frequently asked questions (FAQ) from those interactions are posted on the *2020 Vision* Web site.

Rather than act as the "answer person" to participating students, mentors use their knowledge and wisdom to facilitate discovery. They help students find answers, broaden their knowledge base, and ask more and better questions. The Mentor Program thus offers a unique opportunity for students to interact with Sandia scientists and engineers. It has proven inspiring to both students and participating mentors, and one of the most successful parts of *2020 Vision*.

The *2020 Vision* mentors' areas of expertise cover a variety of topics, including national security, nuclear weapons and other weapons of mass destruction, terrorism, world regional issues, energy use and conservation, environmental issues, and computer technology.

For the 1999–2000 school year, five Sandians from New Mexico volunteered to join the *2020 Vision* mentor ranks.

Teacher Training Institute

Because the first week-long institute we offered in 1998 proved so successful, we offered a second week-long institute in August 1999. Twelve teachers participated in the institute, including three continuing and nine new participants. The institute featured detailed information about Sandia and its role in national security, tours of the California site, two days of intensive scenario development training, one day of implementation training, which included interaction with Sandia mentors, and concentrated Web instruction, with specific attention to the *2020 Vision* Web site and Discussion Room.

Feedback showed that the teachers appreciated the comprehensive training, as well as the materials and resources they received. We gave them a training manual with viewgraphs and handouts to use in the classroom, as well as a fixed spending account to use for classroom materials related to the *2020 Vision* project. Overall, nine of the 12 participants who attended the 1999 Summer Teacher Institute completed the closing evaluation form. Eight of the nine respondents gave the week an overall 5-star rating (highest allowed; see Fig. 3).

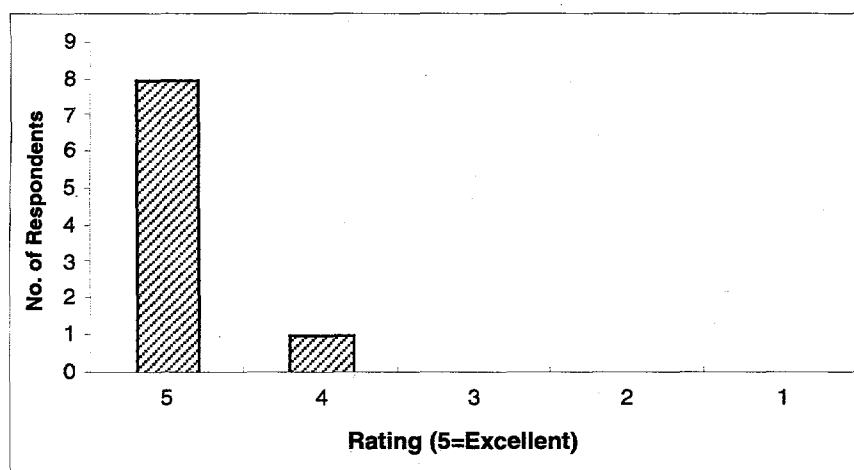


Figure 3. Overall Rating of the Teacher Institute, August 1999.

In general, the teachers' favorite activities during the week were the group activity led by Sandia staff (and *2020 Vision* mentors) Debra Post and John Hinton and the Internet training (both the general "Using the Internet for Research" course and "Using the *2020 Vision* Web Site" course). They also rated highly the information they received on the history of Sandia, the support materials and student handouts, and their interaction with other teachers and with Sandia professionals. Jim Schwarzbauer, a Hermantown High School teacher, offered the following praise, "Thank you for the wonderful conference Sandia hosted. I have been going to conferences for 24 years as a teacher and *2020 Vision* was the very BEST!!" Other teachers commented, "Fantastic training program — great job on preparing teachers to use/implement in the classroom," and "Our country is in very good hands at Sandia from the experts that I had the opportunity to interact and talk with this past week."

Like the students who attended the student conference in April 1999, the teachers felt a bit rushed because of the large amount of information and number of activities provided. However, they were happy with what they received and left wanting more—more information about Sandia, more time to absorb the *2020 Vision* materials, and more time to work on classroom implementation plans. Continuing support will be provided throughout the year.

A Note on Diversity

One of the key features of *2020 Vision* is that it easily adapts to different learning situations. As a result, our participants include a wide range of racial/ethnic, socioeconomic, and academic groups. For example, schools in the Albuquerque, New Mexico, area tend to have a high percentage of Hispanic students, and the eastern schools have a high percentage of African American students. Participating schools also include public, private, and continuation schools located in primarily urban and suburban settings. Economically, they range from lower- to upper-middle class areas. One of the new schools that will participate in *2020 Vision* in the 1999–2000 school year is a public school for academically gifted students from around the state of Virginia. These students cover a broad spectrum of racial/ethnic and socioeconomic diversity. As the *2020 Vision* program has progressed, we have continued to encourage diversity among all participants.

Rewards

The *2020 Vision* program in the high school curriculum provides an effective teaching tool. A great strength of the *2020 Vision* project continues to be the high level of interest it generates among students. They almost universally enjoy the opportunity to think "out-of-the-box" and develop possible answers to questions that really don't have any. The students also benefit from cooperative learning and the use of a variety of research tools, specifically the Internet. The skills they learn through *2020 Vision* can be applied in many areas of their lives.

For teachers, the *2020 Vision* project in FY99 offered opportunities for learning about national security issues and scenario building through formal training, for using more information technology in the classroom, and for interacting with colleagues from other schools, as well as with Laboratory professionals.

Both the students and the teachers gained greater exposure to Sandia National Laboratories and the DOE, as well as to current thinking about national security issues among leading scientists. The interaction with Sandia gives the students an additional source of validation for their creative ideas and a sense of contribution to the national security community.

For Sandia and the DOE, the scenarios offer a generational perspective, free from the biases the older generation has developed from its own experiences. The scenarios also provide some insight into public views of U.S. national security issues. Many Sandians feel that the scenarios act as a catalyst, helping researchers and managers think a little differently about the future. The *2020 Vision* program gives Sandians an opportunity to interact directly with high school students, creating an invaluable learning environment for both students and national security analysts and planners. It thereby also serves as a constituency-building tool, helping educate the public about Sandia's responsibilities for and contributions to national security.

Future Plans

The Education Partnerships Department has recruited nine teachers from four additional high schools to participate in *2020 Vision* during the 1999–2000 school year. Unfortunately, budget cuts will not allow us to provide the level of support activities that we have in the past. However, our goal is to maintain the *2020 Vision* Web site as is (including the online Discussion Room), thereby promoting student use of the Internet for research and direct interaction with Sandia mentors. The mentors will continue to interface with students on a volunteer basis. For more information, please visit our Web site (address below) or contact:

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http://www.ca.sandia.gov/outreach/_k_12/_2020

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