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2020 Vision Project Summary, FY98

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2020 Vision Project Summary: FY98

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ABSTRACT

The *2020 Vision* project began in 1996 with two participating teachers and four classes. It has since grown to comprise more than a dozen participating teachers and hundreds of students across the country. Much of this growth took place in FY98, thanks to the accomplishment of several major goals: implementation of a mentor program, enhanced teacher training, a mid-year conference for students, recruitment of distant schools, and the development of an interactive Web site. The first part of this report describes these accomplishments, as well as future directions for *2020 Vision*. The second part summarizes the scenarios students wrote during the 1997-98 school year. It identifies recurrent themes in the students' scenarios and compares/contrasts them with scenarios written in the first two years of the project.

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2020 *Vision* Project Summary: Fiscal Year 1998

Introduction

The *2020 Vision* project introduces students and teachers to national security issues through a technique called scenario building. Starting with the world as it is today, teams of students develop stories about the future of the United States and different regions of the world, considering how international developments might affect U.S. national security over the next 20 years. The *2020 Vision* program thereby engages students in an interactive process of creating scenarios relevant to Department of Energy Defense Programs.

Looking at the future of national security is traditionally done by people in their 40s, 50s, and 60s, who are often strongly influenced by the experiences of their generation. The Department of Energy and its national laboratories recognize that they can achieve a broader vision with input from the decision-makers of the future—people who are teenagers and young adults today. Sandia's Science Education and Outreach Department developed *2020 Vision* to obtain that input. The program's goals are:

- to understand some of the primary national security issues concerning young Americans from diverse backgrounds and geographic locations;
- to promote critical thinking skills; and
- to introduce teachers and students to the technique of scenario building as a framework for thinking about national security.

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

Part 1: FY98 Accomplishments and Future Plans

During FY98, we met or exceeded all major goals for the year, to include: implementation of a mentor program, enhanced teacher training, a mid-year conference for students, recruitment of distant schools, and development of an interactive Web site. These accomplishments, as well as future directions, are discussed below.

Mentor Program

During Summer 1997, we recruited Sandia scientists and engineers from around the Sandia/California site to serve as volunteer mentors to participating teachers and students. 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.

During the 1997–98 school year, students were encouraged to interact with mentors primarily via e-mail. Students from several schools also had the opportunity to ask questions of mentors through panel discussions at the student conference in February 1998 (more on that below). Frequently asked questions (FAQs) from those interactions are posted on the *2020 Vision* Web site.

For the 1998–99 school year, we are initiating a Discussion Room on the *2020 Vision* Web site, where students, teachers, and mentors can talk about topics related to the program. The students may use the Discussion Room to ask questions of *2020 Vision* mentors or to find out what students at other participating schools think about an issue. Our goal is to create a more free-flowing forum, which will encourage wider participation and discussion of ideas.

Teacher Training Institutes

To enhance the experience of both teachers and students, we offered participating teachers two training institutes:

- a two-part session in Fall 1997 (for teachers participating during the 1997–98 school year)
- a week-long training institute in July 1998 (for teachers participating during the 1998–99 school year).

The two-part training session comprised two days of comprehensive training, one in September and one in December 1997. The first day featured formal presentations on national security (the focal issue), scenario building techniques, and the mentor program, as well as time to practice the principles of scenario building on a sample set of axes provided by the trainers. The second day featured software training, a presentation of the scenario process at Sandia by Pat Falcone (manager of the Systems Studies Department and a scenario practitioner), and a lively panel discussion with a dozen of the volunteer mentors.

Although the teachers benefited from the two days of training, we felt that for them to become more proficient and comfortable implementing *2020 Vision* in their classrooms, they needed more training time. Thus, the week-long *2020 Vision* Teacher Institute was born. Fourteen teachers participated in the institute, which featured detailed information about Sandia and its role in national security; two days dedicated to scenario building; intensive Web browsing/research instruction, with specific attention to the *2020 Vision* Web site and Discussion Room; panel discussions with Sandia mentors on national security topics related to the program, such as terrorism, weapons of mass destruction, energy, and environment; and discussion and activities on integrating *2020 Vision* into the classroom.

Feedback showed that the teachers appreciated the comprehensiveness of the training and the materials distributed to them during the training sessions. Teachers were given a training manual with viewgraphs and student handouts to use in the classroom. The institute was such a success that we plan to host another week-long institute for new teachers in Summer 1999.

2020 Vision Student Conference

We hosted our first conference for students on Friday, February 6, 1998. Students from three local high schools participated,* as well as Sandia/California scientists and engineers.

In the morning session, students from Livermore High and Contra Costa Christian High School presented their scenarios. The Contra Costa students' scenarios were written in the same style as previous scenarios written for *2020 Vision*—a series of 2-page papers for each year addressed. The Livermore High students' scenarios were incorporated in teacher Ron Nicola's "Meeting of the Minds" activity, which he has conducted over the last four years. In this activity, one group of students is divided into teams representing 17 different U.S. Presidents, and a second group of students is divided into six teams responsible for preparing possible scenarios of issues that may be facing the United States over the next 20 years. The issues were related to the "driving forces" used for *2020 Vision*. At the 2020 conference, three "understudies" of former Presidents Lincoln, Truman, and Reagan reported on how they would handle impending crises in futuristic scenarios. The Livermore High students also talked generally about the activity and answered questions from the audience.

During the presentation session, a live video-link to Sandia/New Mexico gave the conference an added technological flair. Students seemed a little puzzled the first time a Sandian from New Mexico asked a question because they only heard a voice coming through the auditorium's public address system.

The conference also featured morning panel discussions, in which students interacted directly with Sandia mentors who served as panelists. The students were assigned to two out of four sessions, which covered topics related to the *2020 Vision* project: Nuclear Weapons, Regional Issues, Terrorism/National Security, and Computer Technology. Both students and mentors learned something new by discussing these issues of national importance.

Feedback from the students, teachers, and mentors indicated that the conference made a big impact on the students and is a valuable addition to the *2020 Vision* program. The most successful part of the conference was the panel discussions; most of the students indicated they would have liked more time to go to all four topical discussions.

Web Page Enhancement and Expansion

At the beginning of the fiscal year, the *2020 Vision* Web pages were still a skeleton of the program and of the information we wanted to provide. We have since redesigned and reorganized the pages to create a more user-friendly, attractive, and informative site (located at http://www.ca.sandia.gov/outreach/2020.html). We also improved page content, to include an interactive discussion area. The pages now comprise:

- an *Overview*, which introduces first-time visitors to the *2020 Vision* project
- a *Participant* page, which lists participating schools and information about how to get involved in *2020 Vision*

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*Livermore High School, Contra Costa Christian High School (Concord), and Village High School (Pleasanton).

- a *Current Events* page, which contains news briefs related to national and international security issues and serves as a resource for students
- a *Discussion Room*, where *2020 Vision* participants (teachers, students, and Sandia mentors) can "talk" to each other (in threaded conversation) about a variety of topics related to the project; it also includes a section on Frequently Asked Questions (FAQ)
- a *News* page, which provides information about upcoming *2020 Vision* events, deadlines, and news articles about *2020 Vision* (links and how to obtain copies)
- a *Resource Library*, which contains links to the following: some good Web sites for the students to begin their research, the Web training site used at the teacher institute in July 1998, a bibliography, and teaching strategies

We also invited and obtained commitments from three high schools outside California to help us enhance Web participation in *2020 Vision* during the 1998–99 school year: St. Pius High School and La Cueva High School in Albuquerque, and Rancocas Valley Regional High School in Mt. Holly, New Jersey. At least two teachers from each school attended the *2020 Vision* Teacher Institute in July 1998 and will incorporate what they learned into their classroom instruction. Our objective is for these schools to achieve learning through communication between participants over the Internet, using the enhanced *2020 Vision* Web site. Our ultimate goal is to implement the *2020 Vision* program primarily using interactive Web resources.

The *2020 Vision* Web site will be an integral part of the project experience for both our neighboring schools and our distant participants during the coming school year. Teachers attending the summer training institute were introduced to the revamped Web pages and helped us troubleshoot potential problems with the new *2020 Vision* Discussion Room. Initial feedback indicates enthusiasm for the site's ease of use and for its design with students in mind. We will encourage and monitor participation and look for ways to continuously improve the site throughout the year.

Rewards

Scenario building in the high school curriculum is 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 benefit from being required to use critical thinking skills—that is, dealing with a problem that has multiple solutions. They also benefit from cooperative learning and the use of a variety of research tools, specifically the Internet. Our Web site offers high school students fun <u>and</u> educational opportunities not found on other Web sites targeted to the teenage audience. The skills they learn through *2020 Vision* can be applied in many areas of their lives.

For teachers, the *2020 Vision* project in FY98 offered additional opportunities for learning about scenario building through formal training, for using more information technology in the classroom, and for interacting with colleagues from other schools.

In FY98, both the students and the teachers gained greater exposure to Sandia National Laboratories and the DOE, as well as 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, the scenarios offer a generational perspective that is sometimes lacking in the national security community. Many Sandians feel that the scenarios act as a catalyst helping researchers and managers think a little differently about the future and incorporate young people's ideas into the planning process.

Future Plans

For the program in FY99, the Science Education and Outreach Department has recruited six teachers from three out-of-state high schools to participate in *2020 Vision*. Our goal is to further promote student use of the Internet for research and for direct interaction with Sandia planners through the *2020 Vision* Web site. We will continue to enhance and expand the Web-based resources and interactivity of *2020 Vision* throughout the coming year, making improvements based on feedback from participants. We also plan to implement a Web-based recruiting plan in the coming year for new teacher participants for the 1999–2000 school year. Our goal will continue to be recruitment of diverse classes—i.e., students from different geographic locations, ethnic groups, and socioeconomic conditions—in order to broaden the range of viewpoints we receive.

We will continue to hold on-site student conferences, student presentations, and teacher training institutes, as well as begin to develop and implement these activities on the Web.

We plan to further expand our means of sharing the *2020 Vision* process and results not only with additional schools, but also with DOE and Laboratory planners. For more information or to offer comments, please contact:

Julie Clausen, (925) 294-4528, jcclaus@sandia.gov, or
Karen Scott, (925) 294-3760, kpscott@sandia.gov

Part 2: Summary of Student Papers

During the 1997–98 school year, students from several schools around California* completed and submitted scenarios, which are summarized below.

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. Those used for *2020 Vision* were: World Government vs. Isolationism (World Cooperation), and Complete Control vs. No Controls (Nuclear, Biological, and Chemical Weapons) (see Fig. 1).

Complete Control

At Peace with Ourselves

- trust for international controls of weapons of mass destruction
- decreased role of U.S. as world leader

A Safer Place

- together for the common good
- comprehensive treaties
- high-tech, international control and monitoring of weapons of mass destruction

Chemical Weapons

Cooperation

Isolationism

World Government

Nuclear, Biological,

Islands in the Storm

- increased strategic defense
- resurgence of historical hostilities
- possible terrorist attacks

United We Stand

- weapons proliferation
- concern about non-state entities/ terrorist use of weapons of mass destruction
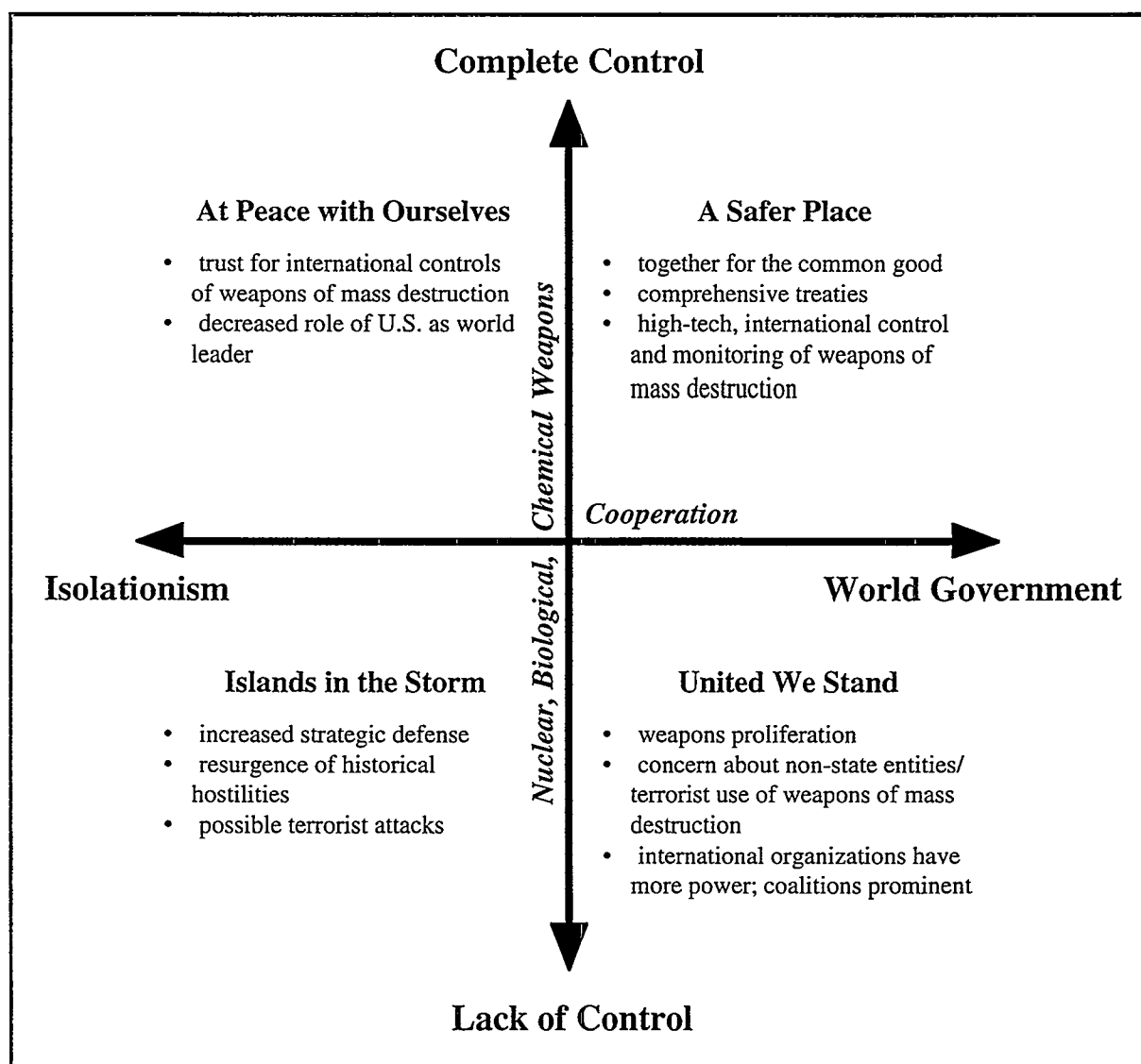- international organizations have more power; coalitions prominent

Lack of Control

Figure 1. *The axis model used for the* 2020 Vision *scenario building exercise during the 1997–98 school year.*

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 themes—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—comprising "regional experts" from the research teams. They then wrote more general scenarios about potential world futures within each quadrant. As described above, the Livermore High students created scenarios related to six contemporary issues, based on the *2020 Vision* driving forces. Thus, the teachers were able to use *2020 Vision* in a variety of class contexts.

In each case, the students wrote scenarios for the years 2000, 2010, and 2020. They then were asked to consider the implications of their scenarios for U.S. national security. However, time constraints prevented some of the classes from completing this step or only allowed them to partially consider the issue.

The following sections offer general observations about the scenarios written during the 1997–98 school year, describe recurrent themes, and compare and contrast FY98 results with FY96 and FY97 results.

General Observations

Having the students focus on regional research and study individual countries prior to scenario development improved the overall quality of the scenarios. For example, the scenarios reflected less "clumping" of countries, that is, treating all countries in a region as one entity (e.g., Europe or South America). The students also began to recognize the cultural and political diversity of countries within major geographic regions. The scenarios, in general, reflected more diverse viewpoints about the world and more 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.

The students also are beginning to better understand the axis model, although some of the scenario plots moved across quadrants or described a world that reflected a quadrant other than the one assigned. In one scenario, the students wrote about the world moving dramatically from one quadrant to another, making sure that it went through all four before ending up in one in the year 2020. In another, the students considered an interesting twist to the World Cooperation axis—more world government allowed the United States to step down from its role as "world policeman" and become more isolationistic.

As in years past, students tended to extrapolate current news events out into their scenarios. For example, many students attributed worldwide and/or permanent environmental damage and climate change to this year's El Niño, not recognizing that it is a periodic climatic occurrence. The potential Y2K problem appeared in numerous scenarios, as did Saddam Hussein (who was continuing to make headlines for not allowing United Nations (U.N.) inspections at the time the students were writing their scenarios). An example of a headliner

that drew no attention this year but appeared frequently in last year's scenarios was Hong Kong's transfer back to Chinese rule. Although one of the major benefits of *2020 Vision* is a heightened student awareness of current events around the world, the students also need to be encouraged to look beyond the headlines to other sources of information and consider issues that may not be in the news today, but might be tomorrow.

Recurrent Themes

Several issues gained notable attention in the students' scenarios: weapons proliferation and warfare, technology, and the global economy. Regional issues also figured prominently; the students focused primarily on regions considered "high risk" to U.S. national security, but they also envisioned some very diverse scenarios for countries and regions considered "low risk" or friendly to the U.S. (Note: Table 1 on page 19 compares and contrasts the recurrent themes in this year's scenarios to those from the *2020 Vision* project's first two years.)

Weapons Proliferation and Warfare

Most of the scenarios centered on wars or other great destruction, such as environmental or resource devastation (even in "good" quadrants). Although "traditional" battles occurred between nations' armies on battlefields, the students also envisioned new kinds of warfare. For example, some saw an increase in the use of long-range missiles targeted on cities to destroy a nation's infrastructure or sub-national military or terrorist groups fighting national armies. Others viewed economic or information warfare becoming more important in deciding the outcome of conflict. Most students also saw terrorism as a permanent feature of future warfare.

The proliferation of weapons of mass destruction (WMD), most notably nuclear weapons, remains one of the biggest concern among students. In many scenarios, students projected that Russian nuclear technology would be sold to or stolen by other countries or terrorists. Other students expressed concern about the potential for nuclear war between India and Pakistan. Some envisioned neighboring countries wanting to shield themselves from this conflict (and possible wartime imperialism) by possessing their own WMDs—a sort of "cold war" between India and Pakistan, with the extended effects on their neighbors.

Many students who envisioned warfare or weapon proliferation also assumed that chemical, biological, or nuclear weapons would be used in conflict or in a terrorist act within the next 20 years. In particular, they painted some vivid images of nuclear warfare—from world destruction or ravaging of whole countries to complete destruction of major cities (some even by nuclear weapon-induced tidal waves).

Even though increasing warfare and bloodshed were prominent themes, more students this year envisioned optimistic conclusions to their scenarios. These students are holding out hope for a better world, even though they often seem unsure of how to get there.

Technology

As in previous years, students' views of technological advances frequently do not reflect a strong understanding of what is technologically possible within a given time frame. Although

nuclear weapons are massively destructive, the students also tended to give them more destructive power than they actually have (e.g., "Six bombs in all were fired and the three chemical and three nuclear and all of the USSR [sic] was taken out.") However, some of their ideas were very creative—and who knows what the future holds? Examples include:

- humanoid robots (i.e., robots that function like humans, rather than industrial robots);
- laser weapons, including laser guns and plasma rifles;
- an extraction process for using geothermal energy, which sparks an Energy Revolution by 2010;
- an "Underground Sonar Technology System...to detect life forms to one-hundred thousand feet below the surface of the ground";
- underwater living modules or space living modules, both of which help solve overpopulation problems;
- a "sensory emulation" drug, which produces its effects through computer-generated virtual reality and thereby cripples the "traditional" international drug trade.

Some students mentioned more common technologies being developed today, such as electric cars, alternative energy sources, intelligent computers, high-tech agriculture, Japanese-made solar cars and pollutant-free factories, and new, efficient military technologies. One scenario had electric cars running 100,000 miles on one battery recharge. Other scenarios told of new energy sources coming from space or from the ocean. Cloning, which was a hot topic in 1997, also was mentioned, but more in the context of organ cloning for use in medical treatment, rather than cloning of whole humans.

Although the technological advances the students imagined would have mainly positive social repercussions, many students tended to view technology and the environment as polar opposites. That is, they projected that either we will live in a high-tech world with a poor environment or we will live in a low-tech world with "lush green plants," as one student put it. Very few students imagined technological solutions to environmental problems.

Many students also tended to foresee negative repercussions associated with the nation's increasing reliance on computer technology. Many scenarios included massive computer and other system shutdowns due to the Y2K problem. Computer systems also were seen as quite vulnerable to terrorist attack.

Global Economy

Most of the students appeared to have gained a better understanding of the global economy and the effect that isolationism or world cooperation could have on this delicate international web, as well as on the U.S. economy. In several scenarios, students foresaw economic improvement in regions such as South America, the Philippines, and Indochina, effectively detailing the entry of these previously economically stagnant regions into the dynamics of the global economic network. In one scenario, Mexico challenged the United States economically, and in another it formed a strong trade alliance with China. A number of students also mentioned the isolation of Japan, which wreaks havoc on the Japanese economy

and/or the world economy. Often, the students projected a ripple effect in the global economy, no matter which direction the economy went in any given region of the world.

Regional Issues

The students generally focused on regions or countries that appear frequently in news headlines—specifically, China, the Middle East, Asian countries other than China, and Russia. Other regions that appeared less frequently, but are the focus of some interesting scenarios include South America and Europe. In their scenarios, the students virtually ignored Canada, Australia, and Africa. Only one envisions more prominent world status for Africa, led by political and economic stability in South Africa. And although several scenarios included Europe, only one of them mentions NATO.

China. China represented the greatest potential future challenge to U.S. national security in the student scenarios. Most students envisioned China becoming a superpower by 2010 or 2020. However, this does not mean that China would necessarily be a threat to the U.S.

Most students envisioned China's continued economic and military growth, including further industrialization and privatization. In a few scenarios, China became a valued U.S. trading partner, but most often, trade relations were strained or the United States eventually revoked China's Most Favored Nation status. China's potential military power sparked a variety of interesting alliances, such as one between China and Mexico, as well as conflict. Some scenarios envisioned a forced reunification of China and Taiwan, civil war within China, or a takeover of other Asian countries. Others envisioned China stockpiling and sometimes using sophisticated WMD, including biological weapons against Russia over boundary disputes.

Most students also foresaw continued population problems within China, despite the one child per family law. Many saw human rights violations causing a continuing quandary for China, although one scenario has China using its tremendous population for economic benefit, as well as developing new agricultural technologies to feed the masses.

Other Asian countries. Japan appeared in a few scenarios, usually within the context of trade with the U.S., technological development, and sometimes a rebirth of militarism. Other Asian countries appeared in the scenarios primarily in the context of war:

- India's and Pakistan's testing of nuclear weapons leads to an arms race and eventually war, or war started over disputed territory;
- North and South Korea go to war;
- Regional conflict—sparked by economic and territorial problems—breaks out among Southeast Asian countries; and
- Civil war erupts in Indonesia, but is eventually resolved, with U.S. intervention.

Middle East. When looking at the Middle East, the students focused mainly on Iraq (led by Saddam Hussein), which continued to be the main source of terrorism and anti-American sentiment well into the 21st century. A few groups did envision other events, such as a war between the Arabs and the Jews in Israel over a Palestinian state. Several scenarios pictured a troubled Middle Eastern economy caused by alternative energy sources replacing oil.

Russia. The view of Russia as the United States' "enemy" continued to decline in this year's scenarios. Students often pictured Russia and the United States as allies—helping Germany economically, for example, or fighting Iraq (which contrasts their historic opposing positions on Iraq). However, scenarios also followed some familiar plot lines of Russia's eventual success or decline. Sometimes the scenarios showed Russia recovering economically and adopting a civil law system. Others saw Russia struggling with civil war, economic collapse, and environmental degradation. The students also often portrayed Russian terrorists selling nuclear weapons, materials, and technologies to various entities (usually states like Iraq), or Middle Eastern terrorists stealing or building their own bombs using Russian materials. The students generally considered Russia's nuclear weapons vulnerable to accident scenarios.

In short, when the students perceived Russia as a threat to the United States, it was indirectly. None of the students viewed 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 problem in South America. However, the students also projected other events for South America. For example, one group envisioned the economic decline of Jamaica, which led to Russia's infusion of capital into the island nation to rebuild its tourist economy. Why was Russia interested in Jamaica? Proximity to the United States. Similar to Cuba during the Cold War, Jamaica served as a base of operation for Russia to wage war on the United States. In other scenarios, free trade between the United States and South America played a prominent role, yet trade disputes also led to conflict. In one, the United States took over Mexico and all Mexican citizens became U.S. citizens. Students also foresaw the United States continuing to sell conventional weapons to South American countries.

Europe. NATO was barely cited in the student scenarios. Some students even envisioned nuclear proliferation among Western European countries, despite NATO's historic provision of a "nuclear umbrella." In some scenarios, it was clear the students needed to do more background research. For example, one declared, "France especially doesn't have that much experience in the field of nuclear arms." In another, the students assumed that Germany has been one country since the end of World War II, not just since the Berlin Wall fell.

However, the students also developed some plausible scenarios for Europe, such as continued conflict in Bosnia, implementation of the euro (a common currency used throughout the European Community), and Germany's economic decline due to unification problems. Some student groups projected political conflict between the United States and traditional allies, such as Italy—which stockpiles nuclear weapons in what it claims to be a defensive posture toward India and Pakistan, and the U.K.—which has trade disputes with the United States. One group even projected that Europe would have closer military ties with China than with the United States within the next 20 years.

United States. Although none of the student groups specifically looked at North America as a region, some of them considered specific possibilities within the United States (vs. effects of external events on U.S. national security). Most focused on economic and political

issues. For example, some foresaw continuing, large trade deficits, product dumping (by the United States in other countries), tariffs, and other trade issues. Others envisioned the United States finally paying off the national debt. In several scenarios, students projected themselves as President (including a female President).

Other Issues

World politics was usually considered in a regional context. However, some students included scenarios about the fate of the U.N., largely as a part of their consideration of the world cooperation axis. Some envisioned a restructuring or retooling of the U.N. in an attempt to strengthen international law. Others foresaw declining membership in the U.N. and eventual dismantlement. At least one group projected a stronger U.N. that succeeds in bringing Iraq under control.

The social issue that drew the most attention in the student scenarios was overpopulation. The students most often projected population problems in China. They also considered scenarios in which Mexico tries to implement a one-child-per-family law or Japan gains additional living space either through imperialism or technology (space living modules). Yet, none of the scenarios considered population issues in India (whose numbers are rapidly closing in on China's). This year's students placed much less emphasis on issues such as education and deadly diseases (e.g., AIDS or Ebola) than students have in the past. However, there seemed to be more concern about women's rights, not only in the United States, but around the world, particularly in Muslim nations.

Few students considered the environment in their scenarios. "New environmental technology" to clean up pollution was mentioned in one scenario, but the students did not elaborate on the new technology. Any other mention of the environment was negative. And the students mentioned global warming only in the context of El Niño's "permanent" effects.

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 1.

Table 1. Comparison and Contrast of Student Scenarios

1996	1997	1998
Conflict and Cooperation		
Dissolution of NATO or U.N.	NATO becomes pro-European peace	Little mention of NATO; U.N. gains strength
War between England and Northern Ireland	Conflict in U.K. mentioned only in theme papers	No mention of England/Ireland conflict
Damming of Euphrates by Turkey	Conflict between Greece and Turkey over Cyprus	Turkey invaded by Russia/Iraq alliance; no mention of Greece
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 mentioned
Resolution of Israel/PLO conflict	Conflict between Israel and its neighbors	War/disputes between Israel and its neighbors
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
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
New Cold War	Russian "loose nukes"	No return to Cold War, but concern about "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
Examples of nuclear terrorism	Rampant nuclear terrorism, including "pocket nukes"	Terrorism of all kinds
Resurrection of "Star Wars" (ballistic missile defense)	No mention of Star Wars	No mention of Star Wars
Global Power Shifts		
China gains power and forms alliance with Russia; also, China has a massive civil war	China becomes a dominant world power; takes over not only Hong Kong, but Taiwan and sometimes other Southeast Asian countries	China becomes major power. Takes over Japan, Taiwan, or other Asian countries; in one, forms alliance with Mexico
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
Dictator in Middle East rising with nuclear capabilities	Middle-Eastern tyrant takes over	Saddam Hussein takes over entire Middle East
Quebec secedes from Canada	Virtually no mention of Canada	No mention of Canada
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.

Continued

Table 1. Comparison and Contrast of Student Scenarios (concluded)

1996	1997	1998
Technology		
Information Revolution leads to more jobs in the U.S.	Information-based society	Computer catastrophes due to Y2K; less benefit from Internet
Information Revolution leads to computer terrorism	Information Revolution leads to computer terrorism	Computers vulnerable, but no direct "computer terrorism"
Society		
Population/human rights problems in China	Population/human rights problems in China	Human rights violations; some resolution of population problems in China
Virtually no mention of Africa	Africa is a source of deadly diseases, chaos, ethnic/civil war	Minimal coverage of Africa
Virtually no mention of South America	Drugs are biggest problem in South America	Drugs remain biggest problem in South America.
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
Improvement of public education in U.S.	Both improvement and decline; increased college enrollment	Virtually no mention of education in the U.S.
Media has negative effect on U.S. society	Media has negative effect on U.S. society	No mention of the media
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)
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
Virtually no mention of South America	South America has problems with corrupt governments	More detailed, specific coverage of regional economics
Depression hits the U.S.	Depression hits the U.S.	U.S. economic problems mild—inflation, trade deficits, sometimes national debt
Energy and Environment		
Japan has a major earthquake, which devastates the economy	No mention of Japan's environment or population	Japan has environmental and population problems
World moves to clean energy source; electric and solar-powered cars	Alternative energy sources, as well as electric and solar automobiles	Alternative energy: solar, hydro., geothermal, space or ocean; also, political implications of new energy considered

More than in other years, some students showed a tendency to move toward the extremes of fatalism or idealism. One scenario concluded that, "Countries and nations throughout the entire world will suffer immensely and eventually lead to the extinction of all plant life and human life. The world as we know it will no longer exist as of 2020." Yet, another concluded, "Fear and loathing disappear from the face of the planet. In conclusion, the world in 2020 will be one of peace, love, and happiness—it will be a paradigm of perfection."

Yet, the scenarios this year generally showed a greater depth of student research and more use of strategic thinking skills than scenarios have in the past. The report-writing styles were less creative, featuring primarily a traditional essay format; however, more students used different types of media in their scenario presentations, such as model villages and people or other props, maps, posters, and staged news conferences. A particularly creative adaptation of *2020 Vision* into a classroom activity is teacher Ron Nicola's "Meeting of the Minds," in which students portraying different U.S. Presidents from throughout history are asked to address potential future scenarios as a part of an "election" campaign.

Although some of the students did not specifically address their scenarios' implications for U.S. national security, almost all of the scenarios reflected an understanding that the United States will be increasingly affected by events around the world. They also are beginning to see the importance of national security issues in their own lives.

Sandia analysts also are gaining a vision of national security issues from a fresh perspective, free from the biases many of them have accumulated during their years working in the field. *2020 Vision* also gives them an opportunity to interact directly with high school students, creating an invaluable learning environment for both students and national security analysts and planners.

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