Roeper Review, 33:8–17, 2011

ISSN: 0278-3193 print / 1940-865X online
DOI: 10.1080/02783193.2011.530202

Routledge
Taylor & Francis Group

Olympiad Studies: Competitions Provide Alternatives to Developing Talents That Serve National Interests

James Reed Campbell and Herbert J. Walberg

Competitions are used by many teachers at the grassroots level to develop the talents of their gifted students. Each year the top Mathematics, Chemistry, and Physics Olympiad students are identified and assembled into national teams that compete against teams from around the world. This article summarizes findings from the American Olympiad study. Our investigators analyzed data from 345 adult Olympians and found that 52% earned doctorates, and these individuals pursued careers in technical areas that benefit the nation. So far these Olympians have published 8,629 publications, and many of the Olympians have assumed positions in universities or research institutions that contribute to the productivity of the United States. Their success supports competitions as a viable alternative for developing the talents of the gifted.

Keywords: Academic Olympians, adult productivity, career development, competitions, cross-cultural, gifted, motivation, parent involvement, talent development

This article places the Olympiad studies into the larger context of using competitions as one of the alternatives that can be used by educators to develop the talents of the gifted. The academic Olympiads were selected for study as representative of the many competitions that are held each year both in the United States and in other countries around the world. There are more than 100 competitions that are being used by teachers in the United States (Karnes & Riley, 1999, 2005). These competitions exist in numerous academic and nonacademic areas (Fine & Performing Arts, Leadership, and Service Competitions).

At the elementary-school level, Campbell (1998) found that the most widely used competitions were Future Problem Solving (http://www.fpsp.com) and Odyssey of the Mind (http://www.odysseyofthemind.com) programs. The two largest high-school competitions are the National Merit Exam and International Science and Engineering Fairs (ISEF). Each involves more than a million participants. Both are national in scope. Campbell, Wagner, and Walberg (2000) found that 18% of U.S. high-school students participate in various competitions each year.

ASSUMPTIONS UNDERLYING COMPETITIONS

All competitions operate under a series of assumptions that constitute a distinctive rationale:

1. Children with talent need to be identified early.
2. Competitions are needed because many schools do not have the differentiated curriculum or the resources that are needed to challenge extraordinary students.
3. Contests will attract participants with extraordinary talent.
4. Contests will motivate the early development of talent.
5. Once developed, this talent is expected to contribute to society.

In this article discussion is provided about the veracity of each of these assumptions. The last assumption is the most important because it encompasses the value of competitions as an alternative for developing the talents of the gifted. If competitions are successful, their participants should make contributions to society.

Received 10 February 2009; accepted 6 October 2009.

No identification of the Olympians or the titles of their books or other products are provided in this article because we promised strict confidentiality and are committed to keeping this pledge.

Address correspondence to James Reed Campbell, St. John's University, 517 Sullivan Hall, Jamaica, NY 11439. E-mail: campbelj@stjohns.edu

How is it possible to learn about such contributions? The only way to uncover these facts is to locate former participants and discover what, if anything, they have accomplished.

In selecting a competition to investigate, four criteria were used: the competition must be international; the principal investigators must have no contact with the sponsors of the competition; the competition must have a small number of winners; and the competition must be prestigious.

The three scholars who initiated these studies (the present authors and Wu-Tien Wu) were experienced cross-cultural researchers. They wanted to conduct parallel studies in different countries. The international criterion eliminated many of the elite American competitions and left only the ISEF and the Olympiads as possibilities. The second criterion—not to have any contact with the sponsoring organization—was used because we wanted to be objective with their analyses and evaluations. The third criterion was added—to select contests with the fewest winners—because we had some experience with following up winners of the Westinghouse Science Talent Search (currently Intel Science Talent Search, STS). Other researchers reported having difficulty locating even very small numbers of Science Talent Search winners (see Javin & Subotnik, 2006). The STS has produced 300 annual winners since 1942 and therefore 20,100 individuals have participated. Finding so many former participants would be a monumental task. For the same reason, ISEF was rejected because there were too many annual participants. Finally, the Olympiad competitions were selected because each domain contest is limited to 20 winners per year. The Olympiads also satisfied the last criterion by having international reputations for excellence.

OLYMPIAD STUDIES

The sports Olympics are conducted every 4 years, whereas the academic Olympiads are run every year. Both of these competitions are built on the same model of selecting national teams that travel to an international host city and compete for medals. The American academic teams compete for their country with the same sense of pride as the sports athletes.

The first assumption listed above—children with talent need to be identified early—was accepted as true by the developers of the first Olympic competition (Soviet Union). In 1934, a series of examinations was initiated to identify the USSR's best mathematics students (Kukushkin, 1996). Once identified, these students were encouraged to enter the technical mathematics, science, and engineering pipelines. In time the Soviet Union extended the competitions to include other technical areas, and their use spread to other European counties. The same line of reasoning has led many countries around the world to sponsor academic contests as a way of identifying and developing their most talented science and mathematics students.

The academic Olympiads are some of the most difficult competitions for high-school students (Olson, 2004). High-school teachers and guidance personnel select their most knowledgeable students to prepare for the demanding tests. The first round of the American Mathematics Olympiad involves 250,000 or more students; the second round of testing is given to those students who have the highest scores; and the third round of testing is used to isolate the top 20 students. These students are then invited to a summer camp, where they are given intense training as preparation for the international competition. At the end of the camp, the top 6 students are identified, and this team is flown to the host city in Asia, Eastern Europe, Europe, or the United States where the 30–40 teams from the other countries compete for medals (Stanley, 1987).

Most countries use a similar selection process to isolate the students who compete in the international competitions. For the American Mathematics Olympiad, the students selected for the summer camp represent the top 0.00008% of the students who participate. In some countries such as Mainland China, over one million mathematics students take these tests before the top 20 students are identified (0.00002%). For all of the national Olympiad programs, the students who are selected represent the top tenth of one percent of the participants.

The United States did not launch any academic Olympiad program until 1972 when the Mathematics Olympiad was started (Turner, 1978). However, countries in both Eastern and Western Europe began these competitions decades earlier.

The American Olympiad studies involve three separate competitions; namely, the Mathematics, Chemistry, and Physics Olympiads. Table 1 illustrates the sponsoring organizations, the age ranges of the former participants, and the number of cohorts being followed.

What skills and preparations are needed to win these academic contests? The tests used in the three Olympiads are constructed by scientists and mathematicians in each domain. These subject-matter tests delve into current

TABLE 1
American Olympiad Samples and Sponsors

	Mathematics ($N = 125$)	*Chemistry* ($N = 140$)	*Physics* ($N = 92$)
Starting year	1972	1984	1987
Cohorts/years	36	24	22
Age range	15–51	15–42	15–39
Sponsor	Mathematical Association of America	American Chemistry Society	American Association of Physics Teachers

Note. Twelve Olympians are national finalists in two domains, making the $N = 345$.

research problems in each domain. To do well the student must accumulate extensive subject matter knowledge to the point where he or she is able to understand the current research literature and analyze problems confronting scientists, engineers, and mathematicians in that domain. This acquisition of knowledge takes months or even years to assemble. This acquisition of knowledge causes these students to leapfrog over their high-school peers.

Critics dismiss competitions because there are so few winners and many more participants who do not win the contest. However, many of the nonwinners also benefit by acquiring in-depth subject-matter knowledge that they will use later in their academic careers. Many of them learn to read the research literature, and this accomplishment requires discipline and effort. These skills and attributions will pay dividends later in their lives (Campbell, 2002).

Figure 1 provides an overview of the Olympiad studies from their inception in 1995. The second round of data collection occurred in 1998 with the Mathematics, Chemistry, and Physics Olympians from the United States, Taiwan, Germany, and Finland. The third round took place in 2006 and involved the Mathematics, Chemistry, and Physics Olympians from the United States, Germany, Korea, and Finland.

The original goal was to have parallel studies underway in the United States, Asia, Europe, Scandinavia, and Russia, together with one or more of the former Soviet Union's satellite countries. Because the Soviet Union initiated these academic Olympic competitions with their Eastern Europe allies, it follows that they would have generations of participants to study. However, actualizing this goal proved difficult. The first wave of data collection was limited to only the United States, China, and Taiwan. Researchers from Russia and Japan were invited to join in this effort, but the principal investigators selected were not able to collect any data. For the second and third waves of data collection, we were fortunate to get principal investigators in Germany and Finland. Invitations were sent to senior scholars in Romania, Russia, and Cuba, and for a time we thought

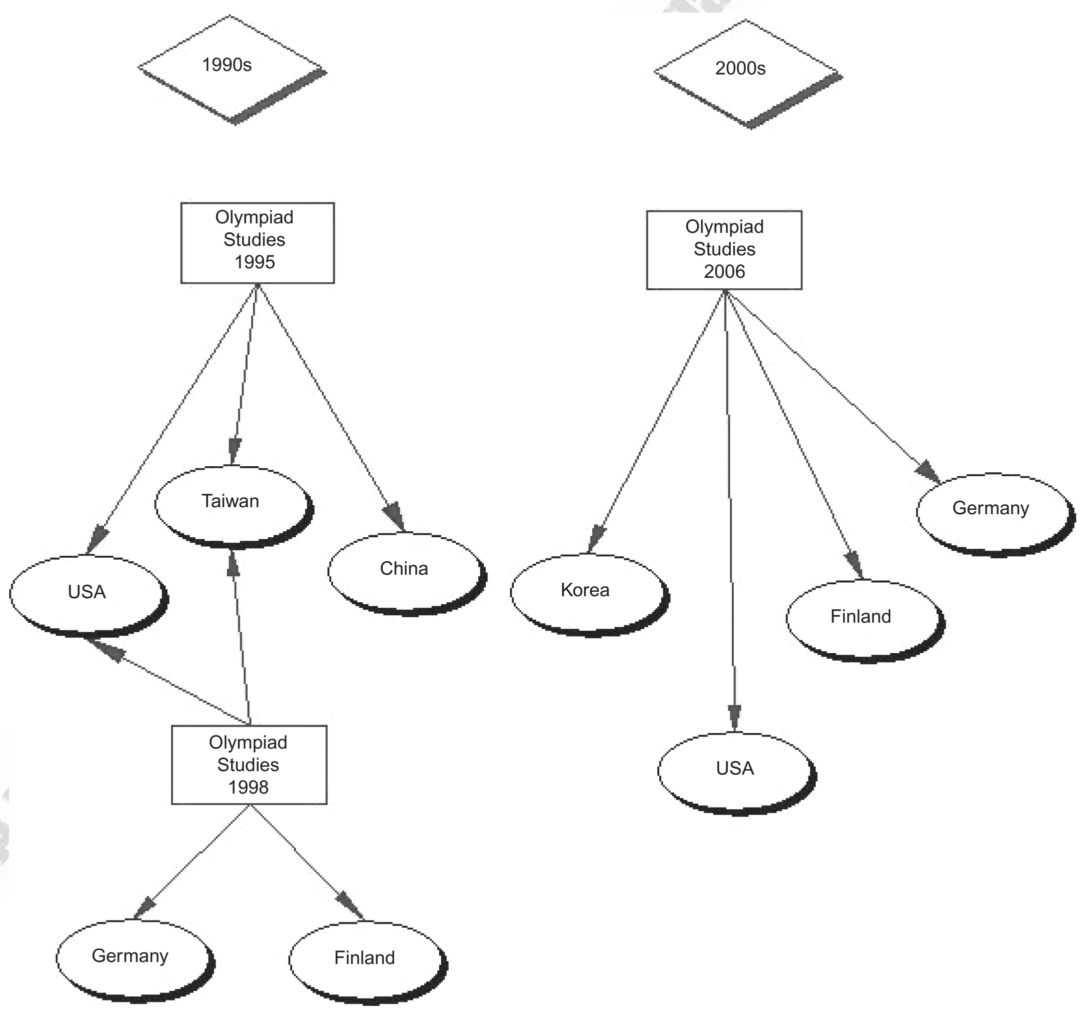

FIGURE 1 Olympiad studies.

we had commitments, but problems concerning funding or other obstacles eliminated these countries from participating.

Invitations to join in the Olympiad studies were limited to researchers with the expertise needed to conduct qualitative/quantitative cross-cultural studies. The principal investigators we selected were senior scholars who were open to collaborative efforts. One by-product of these collaborations has been the cross-fertilization of methods and ideas. The principal investigators have published together and have benefited from their varied viewpoints and areas of expertise (Campbell, Tirri, Ruohotie, & Walberg, 2004).

RESEARCH QUESTIONS

The two main research questions addressed in these studies were as follows:

1. Do the Olympians make important contributions to society? (Do they fulfill their potential? Do the Olympiad competitions serve the national purpose?)
2. What factors help or hinder the development of their talents?

The second research question will not be addressed in this article but will be stated or implied in other articles included in this theme issue. The first research question is, in essence, the fifth assumption listed earlier. In order to answer this question we used the following subset of research questions:

1. What colleges/universities did the Olympians attend? How many doctoral degrees did the Olympians earn?
2. What careers did the Olympians select? Are they doing well in their careers?
3. Did the Olympians remain in the field originally identified?
4. How productive are the Olympians? How many publications did they produce?

In addition to these research questions, our researchers evaluated the effects of the Olympiad programs by asking the following questions: What effect did participation in the Olympiad program have on these talented individuals? Did it widen their horizons? Did it open doors for them? Were there negative side effects?

We asked the Olympians and their parents to judge the Olympiad experience and the long-term effects of participation.

METHODS AND INSTRUMENTS

The Olympians were mailed a questionnaire that contained 14 pages of questions together with the *Self-Confidence Attribute Attitude Scales* (SaaS). Their parents were mailed the Parents' Questionnaire, (Campbell, 1986a) that contained 10 pages of questions, and the Campbell's *Inventory of Parental Influence* (IPI) (Campbell, 1986b). Dillman's (1978, 1991) total design method (TDM) was followed in the layout of each questionnaire, the placement of questions, and the mailing schedule. Dillman's TDM has been designed to produce a response rate of 70%. We used this percentage as our goal in every round of data collection in each of the subject domains. To achieve this high rate of responses, we sent packages of our instruments over and over again to the nonrespondents explaining to them that they represented a unique sample that really could not be duplicated. Over the 12-year period of collecting data, some Olympians would ignore our invitations only to respond during the next wave of collection. Forty of the American Olympians responded to two waves of data collection by filling out each of the surveys and instruments a second time. We used this extra data to validate the original data submitted.

There are overlapping sections in the parents' and Olympian's questionnaires, including home/school influences, college/graduate school experiences, impact of the Olympiad program, and background information. The overlaps were done to make sure that data collected could be verified. The goal was to establish the validity of the information that was collected. The methods used in the Olympiad studies are described in more detail in other sources (Campbell, 1996a; Campbell, Tirri, et al., 2004).

Descriptions of the SaaS and the IPI and the methods used to derive the different scales are also available in published sources (Campbell, Heller, & Feng, 2004; Campbell & Verna, 2004, 2007). Other articles in this theme issue utilize some of the scales that are produced from these instruments.

The evaluation of the Olympiad programs used two pages of questions. Four of these questions were open-ended where the Olympian could supply qualitative feedback. The information from these questions has been published elsewhere (Campbell, 1996b). The other seven questions supplied space for comments or explanations. The only evaluative question with a yes or no answer asked whether the Olympian would have accomplished as much without the program.

DESCRIPTION OF THE AMERICAN OLYMPIANS

Over the years of data collection, Campbell, Feng, and Verna secured responses from 345 winners of the American Mathematics, Physics, and Chemistry Olympiad programs. Ninety Olympians were in high school or college (ages 15–22); 131 were getting their graduate degrees or were in the workforce (early careers, ages 23–29); and 124 (mature career, ages 30–51) were occupied in their professional careers (Campbell, 2000; Campbell et al., 2000; Feng &

Campbell, 2000; Feng, Campbell, & Verna, 2001, 2002; Verna & Campbell, 2000, 2002; Verna & Feng, 2002).

We received responses from substantial percentages of these Olympians (94% Mathematics Olympians; 70% Physics Olympians, 68% Chemistry Olympians). We had difficulty in maintaining valid mailing addresses/computer e-mail addresses because of the mobility of the Olympians. We used three different addresses to track the Olympians (home, work, college), but over the years one or more of these addresses became invalid. We also used the parents' addresses to continue the tracking, but again the mobility of these families made it difficult for us to have any way of maintaining contact. We were still able to secure responses by repeated mailings and placing phone calls or sending e-mail messages. The number of viable Olympians in each domain was calculated by subtracting those with obsolete or invalid mail/e-mail addresses and phone numbers that were no longer operative. Only two Olympians refused to participate and sent us letters to this effect. The main complaint we had from the nonrespondents was that our packet of surveys and instruments was too long and took too much time to complete.

Table 2 summarizes the demographic data of the American Olympians. This sample consists of 89% males, 11% females; 75% Caucasians, and 24% Asian Americans (with 1 Hispanic and 1 African American). While the Olympian was growing up, the family structure consisted of 11% one-parent families and 89% two-parent families. In terms of immigration, 11% of these Olympians are immigrants; 33% are the children of one or both immigrant parents; and 56% are third-generation Americans where every family member was born in the United States. In terms of socioeconomic status (SES), the mean was 82.71 (Nam & Boyd, 2004; Nam & Powers, 1983). Miller (1991) summarized group occupational status scores for the Nam-Powers-Boyd scale to be 85 for professionals, technical, and kindred occupations and 79 for managers, officials, and proprietors. In terms of SES, the families of the Olympians originate from both sets of occupations and come from across the United States.

TABLE 2
Description of the American Olympians From 2009 Synthesis
($N = 345$)

Gender	*(%)*
Males	89
Females	11
Ethnic group	
Caucasians	75
Asians	24
Hispanics	0.3
African Americans	0.3
Family structure	
One-parent family	11
Two-parent family	89
Generation	
1st Generation (immigrants, born overseas)	11
2nd Generation (children of one or both immigrant parents)	33
3rd Generation (parents & Olympian born in United States)	56
Socioeconomic status	
$M = 82.7173$	
$SD = 12.51$	

RESULTS

The findings that are reported in the Results section deal only with the American Olympians. Let us now answer the subset of research questions.

What colleges/universities did the Olympians attend? How many doctoral degrees did the Olympians earn? The Olympians were successful in enrolling in the most prestigious colleges/universities (see Table 3). Table 3 simply lists the 20 institutions where most of the Olympians earned degrees.

The top five universities are Harvard, MIT, Princeton, University of California, Berkeley and Stanford, and the other 15 listed in the table constitute an elite set of universities. The extent of the Olympians' graduate training is evident from the fact that Olympians pursued their advanced degrees in the same institutions listed above. One hundred seventy-nine Olympians (52%) completed, or are in the process of completing, doctorate degrees (MD, PhD, JD; Mathematics 57%, Chemistry 49%, Physics 41%). Among the doctorate degrees there are 10 law degrees and 26 MDs. Terman (1954), in his monumental longitudinal study, found

TABLE 3
Colleges and Universities Attended by Olympians

Colleges/Universities	*Number enrolled undergraduate*	*Number enrolled graduate*	*Total enrolled*
Harvard	66	40	106
MIT	35	27	73
Princeton	23	14	37
U.C. Berkley	9	21	30
Stanford	12	17	29
Cal. Tech.	13	9	22
U. Chicago	5	12	17
U. Illinois	5	8	13
Duke	8	4	12
Cambridge (England)	4	6	10
Rice	8	2	10
Cornell	4	4	8
Carnegie Mellon	5	2	7
U. Michigan	5	2	7
Yale	4	3	7
Northwestern	3	3	6
UCLA	1	4	5
Oxford (England)	4	0	4
Columbia	2	2	4
Johns Hopkins	1	2	3

that 26.3% of 800 gifted males had their doctorate or law degrees. The Olympians far exceed this percentage.

What careers did the Olympians select? Are they doing well in their careers? One hundred thirty-eight Olympians (40%) selected careers in academia—teaching at colleges or universities or doing research. One hundred seventeen Olympians (34%) have careers outside academia (see Table 4). Thirty-nine Olympians are pursuing science and engineering careers, 21 are employed in computer areas, and 10 are employed in the business sector. Forty-seven are employed in a variety of other occupations.

There is no way to determine the contribution made by the Olympians in the nonacademic community, but the job titles indicate a number of responsible positions. The most financially successful might include the 10 Olympians employed by financial institutions on Wall Street. One is an executive at the prestigious Salomon Brothers; 1 is a bond trader; one is an associate with Goldman Sachs; and 2 are financial analysts with major banks. One of the 10 lawyers was the council for the mayor's office in one of the largest cities in the United States.

Of the 21 Olympians employed in the computer industry, 2 founded software companies, 2 are currently the CEO of their respective companies, and another remains an executive with his company. Another Olympian is the executive director of a nonprofit corporation.

For the scientists or engineers, 1 is a principal engineer with nine patents; another is a scientist at Los Alamos National Laboratory; 2 are researchers at the Bell Labs (AT&T); 2 others are senior scientists at IBM; 1 is a scientist with DuPont; and 1 is a scientist at Raytheon.

Two of the Olympians are Talmud scholars, and 1 is on the way to becoming a priest. Four of the Olympians are teachers, and two of them coauthored 2 textbooks. Another Olympian founded a journal that is in its 14th year, and another is a correspondent with a science magazine. One Olympian performed with a musical ensemble at Carnegie Hall; another is an independent filmmaker, and still another works at the U.S. State Department.

Did the Olympians remain in the field originally identified? This research question is difficult to answer because there are so many fields that have connections to the original three domains where the Olympians competed. Twelve Olympians are national winners in two Olympiad competitions. With 10 Olympians securing law degrees and 25 becoming medical doctors, it is evident that these 35 individuals did not select careers within the domain where they won early distinction.

For the Chemistry Olympians, 2 earned law degrees and 20 have MDs. Six Physics Olympians have law degrees and 5 have MDs, and the Mathematics Olympians have produced 2 lawyers. There are also linkages with mathematics and computers, and 21 Mathematics Olympians have selected careers in this domain. The 39 scientists, and especially the 57 Olympians listed under "other occupations" in Table 4, have all veered into careers that are not strictly within the original domain. Americans are known for their flexibility, and it should come as no surprise that they gravitate into a myriad of careers outside of the domain that interested them in high school.

How productive are the Olympians? How many publications did they produce? How successful are these Olympians? One measure of postsecondary faculty and staff productivity involves tabulating the number of publications produced. The 345 Olympians produced a total of 8,629 publications (see Table 5).

Table 6 provides the total publications for the three age cohorts. The bulk of these publications were written by Olympians in their 30s or 40s. The youngest cohort averaged 5.09 publications, the early career Olympians averaged 15.86 publications, and the mature career Olympians averaged 49.14 publications. In a separate article in this theme issue we contrast the most and least productive Olympians. The most productive ones account for a disproportionate

TABLE 4
Olympians' Occupations (Not in Colleges and Universities)

Number	*Occupation/Job title*
Computer occupations	
5	Computer programmer/analyst
2	Computer music companies
2	Software developer
5	Software/hardware engineer
2	Founded software companies
1	Software company executive
1	Founder Internet company
1	Director product design (software)
1	Microsoft program manager
1	Computer programmer/algorithm designer
Scientific occupations	
35	Scientists/engineers (including 1 principal engineer with 9 patents, 1 at Los Alamos National Laboratory, 2 at Bell Labs [AT&T], 1 at IBM, 1 at DuPont, 1 at Raytheon)
1	Consultant—scientific programmer
1	President & CEO technology corp.
1	System integrator
1	Product line manager
Other occupations	
10	Wall Street (including 4 financial analysts, 1 bond trader)
10	Lawyer
25	Medical doctor
4	Teacher (two authored textbooks)
2	Talmud scholar
1	Priest (seminary)
1	Executive director of nonprofit corporation
1	Correspondent (scientific magazine)
1	Independent film maker
1	U.S. State Department
1	Arts administrator

TABLE 5
Total Publications by Subject Domains

Olympiad subject(s)	*Mean*	*N*	*SD*	*Sum*
PUB_TOT				
Mathematics	44.75	117	78.905	5236
Physics	10.31	84	20.497	866
Chemistry	18.11	132	44.063	2391
Mathematics & Physics	17.75	4	21.109	71
Mathematics & Computers	16.50	2	23.335	33
Mathematics & Chemistry	.00	2	.000	0
Physics & Chemistry	8.00	4	11.804	32
Total	25.01	345	56.201	8629

TABLE 6
Total Publications for Age cohorts

Age cohort	*Mean*	*N*	*SD*	*Sum*
PUB_TOT				
Young (16–22)	5.09	90	14.204	458
Early Career (23–29)	15.86	131	34.395	2078
Mature Career (30–51)	49.14	124	80.442	6093
Total	25.01	345	56.201	8629

number of these publications (see Campbell & Feng, this issue).

The U.S. National Center for Educational Statistics is currently conducting a national study of 11,000 higher education faculty in 480 institutions (National Survey of Postsecondary Faculty [NSOPF]; Kirshstein, Matheson, & Jing, 1997). The NSOPF data for 1992 show that the average number of publications for all college faculty was 4.6 per year. However, the faculty publication rate was much higher at research institutions (7.35 per year for public colleges/universities; 7.95 per year for private ones).

Some Olympians have higher publication rates than the NSOPF faculty. Four of the Olympians have over 100 publications, and 8 Olympians in their 30s have produced between 50 and 99 publications. These academic "stars" are in positions of leadership. For example, at 44 years of age, one is director of Whitehead/MIT Center for Genome Research and has made contributions to cancer research. He has published 229 articles, research papers, and technical reports and two books and serves on 12 editorial boards. Another 46-year-old Olympian serves as the editor for two journals, published one book, and has six chapters in books, 51 articles in refereed journals, and 37 research papers. He is active in research dealing with electrical and computer engineering projects, and in 1994 served as a member of the Defense Science Board studying cruise missile defense.

EVALUATION OF OLYMPIAD PROGRAMS

Would the Olympians have turned out as well without the Olympiad programs? This is a fundamental question we asked the adult Olympians and their parents. It is important to emphasize that our research team has no connection with any of these Olympiad programs. Our evaluations are objective.

Both the Olympians (76%) and their parents (70%) expressed the view that they would not have accomplished as much without the programs. When asked whether the programs helped or hindered their acceptance of their talents, 76% of the Olympians and 74% of their parents concluded that the program helped. Only 4% of the Olympians and none of the parents thought the Olympiad programs hindered the development of their talent in any way. Most Olympians (76%) and their parents (83%) reported that the program helped to increase their awareness of educational opportunities.

CONCLUSIONS

Do the Olympians make important contributions to society? Do they fulfill their potential? Do the Olympiad competitions serve the national purpose? These research questions refer back to the fifth assumption—once developed, this talent is expected to contribute to society. When the contributions of the Olympians are summed, including the number of doctorate degrees earned, the number of Olympians working as professors (many in technically needed areas), the number of scientists (some in sensitive and needed areas), the 8,629 publications produced, and the number of Olympians working in the computer industry, including several who have founded or managed software companies, we must conclude that the Olympians serve the national interest. They do make important contributions, and a number of them fulfill their high potential. Overall, the quality of their contributions outweighs their small numerical numbers. Many of the Olympians are working in leadership positions that magnify their influence.

It must also be remembered that many of these contributions listed above are limited to the oldest Olympiad cohort (124 individuals between the ages of 30–51). These Olympians are in the prime of their careers and can be expected to make many more contributions over the next 20 to 30 years. Furthermore, the younger cohorts can also be expected to assemble a long list of their own contributions.

The Olympiad studies also shed some light on two of the other assumptions. First is Assumption Three—Contests will attract participants with extraordinary talent. The German Olympiad study (Heller & Lengfelder, 2000) found that many of the schools in Germany did not participate in the Olympiad studies even though their students had sufficient talent to compete. The same problem occurs in the United States, where many schools should routinely enter their capable students in the Olympiad competitions but do not.

Furthermore, in the German (Lengfelder & Heller, 2001, 2002) and Korean Olympiad studies (Cho, 2001), many teachers did not nominate bright female students who had the capability to do well in these competitions. This systematic bias may be cultural in nature, but the same bias has also been found in American schools (Feng et al., 2002). Consequently, our data do not support this assumption.

The other assumption where we can report findings is Assumption Two—Competitions are needed because many schools do not have the differentiated curriculum or the resources that are needed to challenge extraordinary students. The qualitative data from the American Mathematics study (Campbell, 1996b) is especially relevant here. Some of the U.S. Mathematics Olympians report intuitively grasping the underlying algorithms of much of the mathematics taught to them in elementary school. These precocious children realized that some of their teachers did not understand this basic information. This realization caused the Olympians to lose respect for these teachers and caused the teachers to view these precocious students as threats.

How can we challenge such advanced children with the regular curriculum that is provided in most elementary and secondary schools? Some of the competitions encourage students to work at college or research labs where the work is far beyond anything being taught in their science classes (Campbell, 1985). Most schools simply do not have the resources to match the facilities and equipment available at these institutions. It is more sensible for schools to funnel such capable students into these advanced labs for the challenges that are not available in the conventional high school.

GENERALIZING TO OTHER COMPETITIONS

Having evaluated three Olympiad competitions, what inferences can be made about other American competitions? Do they also serve the national interest? Our major findings should certainly apply to the other elite competitions. It is reasonable to infer that the Intel Science Talent Searches, the Junior Science and Humanities Symposium (JSHS) competitions, the Study of Mathematically Precocious Youth (SMPY) programs, the International Science and Engineering Fair (ISEF) Science Fairs, and the National Merit Exams all funnel talented students into productive careers.

The cost of these American competitions is surprisingly low. Participation in the Mathematics, Chemistry and Physics Olympiad programs costs approximately $100 (U.S.)/school. The costs for the science fairs, the Intel STS, the JSHS, and the ISEF science fairs are paid by companies, foundations, or the government. For the most part, students competing in these contests use resources outside the schools.

Our message to the professional sponsors and the scientists, engineers, mathematicians, and social scientists who devote so much of their time and energy to these competitions—your time is well spent. The same message can be delivered to the many teachers at the grassroots level who instinctively understand the potential of these contests. Both groups can be assured that the United States is better off because of their unselfish efforts.

The message to other teachers is to think about the possible benefits to the very talented students in your classes. Can these talents be challenged by entering these students in one of the competitions that are underway at every grade level in every subject area? Even if your school does not have a program for the gifted, it is always possible to find a competition that could stimulate a talented student. The teacher would need to provide guidance and must be willing to work with this student individually. Remember, once you develop a child's talents, this development can have ripples over the course of that individual's lifetime.

Campbell (1985, 1988, 1992) studied the impact of the Intel STS on the participants and found that in order to succeed in this competition the students need to develop the following skills, attitudes, and orientations: learn to manage time; develop the library skills needed to conduct technical searches; learn how to read scientific and other advanced material; develop the organization skills needed to manage a research project; and, finally, develop the discipline needed to conduct scholarly research studies or to learn how to study for challenging examinations. These enhanced skills not only help the student do well in the contests but can also be applied in future schooling or later in their careers. Even if participants do not win the contest, these newly developed skills will prove very useful. In this sense there are no "losers" in a competition where the participants learn things they can use to enhance their development.

RECOMMENDATIONS

In an era of ever-rising costs for schools, it is refreshing to find cost-effective, inexpensive ways to develop the talents of gifted students. The following recommendations are warranted:

- Talented students exist in every American high school, and therefore participation in the Olympiad programs and in other elite competitions should become the rule, not the exception.
- Talented females and minority students need to be encouraged to participate in the elite competitions;

therefore, programs need to be institutionalized for this purpose.

- Principals and leadership teams should realize their roles in developing extraordinary talent. Schools that produce winners in competitions gain reputations that benefit the whole school and their communities.
- Teachers who are successful at producing winners year-by-year should be recognized, and a reward system should be instituted for such teachers.

Finally, Tannenbaum (1981) observed that a pendulum exists in providing programs for the talented and gifted in the United States. One extreme emphasizes the development of talent that the nation needs (meritocracy). This extreme, however, leads to accusations of elitism that jeopardize gifted programs. At the other extreme, egalitarianism (equality for all) is the driving force behind the elimination of many tracking programs that have served the gifted. The older Olympians send us notes stating that the gifted programs that helped them in developing their talents are being demolished in favor of equity programs for minorities. We have no quarrel with schools providing equity programs, but such programs should not replace programs that are needed to develop the nation's technical talent that is so vital to the nation's survival.

REFERENCES

Campbell, J. R. (1985). The phantom class. *Roeper Review, 7*, 228–231.

Campbell, J. R. (1988). Secrets of award winning programs for gifted in mathematics. *Gifted Child Quarterly, 32*, 362–365.

Campbell, J. R. (1992, October). *Study of Westinghouse Talent Search winners*. Paper presented to the National Science Foundation, Committee on Equal Opportunities in Science and Engineering, Washington, DC.

Campbell, J. R. (1996a). Developing cross-cultural/cross-national instruments: Using cross-national methods and procedures. *International Journal of Educational Research, 25*, 485–496.

Campbell, J. R. (1996b). Early identification of mathematics talent has long-term positive consequences for career contributions. *International Journal of Educational Research, 25*, 495–534.

Campbell, J. R. (1998, April). *Messages from the field: American teachers of the gifted talk back to the research community*. Paper presented at the Annual Meeting of the American Educational Research Association, San Diego, CA.

Campbell, J. R. (2000, April). *Overview of academic Olympiad studies*. Paper presented at the Annual Meeting of the American Educational Research Association, New York, NY.

Campbell, J. R. (2002, August). *Academic competitions: One of the secrets of America's success at developing exceptional talent*. Paper presented at the International Conference on Education for the Gifted in Science, Busan, Korea.

Campbell, J. R., Heller, K., & Feng, A. X. (2004). Restructuring attribution research with cross-cultural data. In J. R. Campbell, K. Tirri, P. Ruohotie, & H. Walberg (Eds.), *Cross-cultural research: Basic issues, dilemmas, and strategies* (pp. 27–60). Hameenlinna, Finland: Hame Polytechnic.

Campbell, J. R., Tirri, K., Ruohotie, P., & Walberg, H. (2004). *Cross-cultural research: Basic issues, dilemmas, and strategies*. Hameenlinna, Finland: Hame Polytechnic.

Campbell, J. R., & Verna, M. (2004). Academic home climates across cultures. In J. R. Campbell, K. Tirri, P. Ruohotie, & H. Walberg (Eds.), *Cross-cultural research: Basic issues, dilemmas, and strategies* (pp. 27–60). Hameenlinna, Finland: Hame Polytechnic.

Campbell, J. R., & Verna, M. (2007). Effective parental influence: Academic home climate linked to children's achievement. *Educational Research and Evaluation, 13*, 501–519.

Campbell, J. R., Wagner, A., & Walberg, H. (2000). After school and summer programs, competitions and academic Olympics. In K. Heller, F. Monks, R. Sternberg, & R. Subotnik (Eds.), *International handbook for research on giftedness and talent* (2nd ed., pp. 523–535). Oxford, England: Pergamon.

Campbell, J. R. (1986a). *Self-Confidence Attribute Attitude Scales (SaaS)*. Queens, NY: St. John's University.

Campbell, J. R. (1986b). *Inventory of Parental Influence (IPI)*. Queens. NY: St. John's University.

Cho, S. (2001, April). *Korean gifted girls and boys in science and mathematics: What influenced them to be Olympians and non-Olympians?* Paper presented at the American Educational Research Association, Seattle, WA.

Dillman, D. A. (1978). *Mail and telephone surveys: The total design*. New York, NY: Wiley.

Dillman, D. A. (1991). The design and administration of mail surveys. *Annual Review of Sociology, 17*, 225–249.

Feng, A. X., & Campbell, J. R. (2000, April). *Facilitating the development of talent for American Physics Olympians*. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA.

Feng, A. X., Campbell, J. R., & Verna, M. (2001). The talent development of American Physics Olympians. *Gifted and Talented International, 16*(2), 108–127.

Feng, A. X., Campbell, J. R., & Verna, M. (2002). Understanding gender inequity in America: Interviews with academic Olympians. *Journal of Research in Education, 12*(1), 93–100.

Heller, K. A., & Lengfelder, A. (2000, April). *German Olympiad study on Mathematics, Physics and Chemistry*. Paper presented at the American Educational Research Association, New Orleans, LA.

Javin, L., & Subotnik, R. F. (2006). Understanding elite talent in academic domains: A developmental trajectory from basic abilities to scholarly productivity/artistry. In F.A. Dixon & S. M. Moon (Eds.), *The handbook of secondary gifted education* (pp. 203–220). Waco, TX: Prufrock Press.

Karnes, F., & Riley, T. (1999). *Competitions: Maximizing your abilities through academic and other competitions*. Waco, TX: Prufrock Press.

Karnes, F., & Riley, T. (2005). *Competitions for talented kids*. Waco, TX: Prufrock Press.

Kirshstein, R., Matheson, N., & Jing, Z. (1997). *Instructional faculty and staff in higher education institutions: Fall 1987 and fall 1992* (NCES 97–470). Washington, DC: Office of Educational Research and Improvement.

Kukushkin, B. (1996). Olympic movement in Russia. *International Journal of Educational Research, 25*, 553–562.

Lengfelder, A., & Heller, K. (2001, April). *German Olympiad Studies: Findings from in-depth interviews*. Paper presented at the American Educational Research Association, Seattle, WA.

Lengfelder, A., & Heller, K. (2002). German Olympiad studies: Findings from a retrospective evaluation and from in-depth interviews: Where have all the gifted females gone? *Journal of Research in Education, 12*(1), 86–92.

Miller, D. C. (1991). *Handbook of research design and social measurement* (5th ed.). Thousand Oaks, CA: Sage.

Nam, C. B., & Boyd, M. (2004). Occupational status in 2000. *Population Research and Policy Review, 2*, 327–358.

Nam, C. B., & Powers, M. G. (1983). *The socioeconomic approach to status measurement (with a guide to occupational and socioeconomic status scores)*. Houston, TX: Cap & Gown Press.

Olson, S. (2004). *Count down: Six kids vie for glory at the world's toughest competition*. New York, NY: Houghton Mifflin.

Stanley, J. (1987). Making the IMO team: The power early identification and encouragement. *Gifted Child Today, March/April*, 22–23.

Tannenbaum, A. J. (1981). Pre-Sputnik to post-Watergate concern about the gifted. In W. B. Barbe & J. S. Renzulli (Eds.), *Psychology and education of the gifted* (3rd ed., pp. 20–37). New York, NY: Irvington.

Terman, L. (l954). Scientists and nonscientists in a group of 800 gifted men. *Psychological Monographs, 68*(7), 1–44.

Turner, N. D. (1978). A historical sketch of the Olympiads, national and international. *The American Mathematical Monthly, 85*, 802–807.

Verna, M., & Campbell, J. R. (2000, April). *Career orientations for American Chemistry Olympians*. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA.

Verna, M., & Campbell, J. R. (2002). Chemistry Olympians' academic development and academic productivity. *Tempo, 22*, 1–22.

Verna, M. A., & Feng, A. X. (2002). American Chemistry Olympians achieve the highest level of equity. *Journal of Educational Research, 12*, 101–104.

AUTHOR BIOS

James Reed Campbell, **PhD**, is an established researcher on the national and international scene. He has authored six books and more than 250 articles and research reports. He is best known for his books for parents. He co-authored (J. R. Campbell, H. Wagner, & H. J. Walberg, 2000) a chapter in the *International Handbook of Giftedness and Talent* (2nd ed.) and co-authored (J. R. Campbell, K. Tirri, P. Ruohotie, & H. J. Walberg, 2004) *Cross-Cultural Research: Basic Issues, Dilemmas, and Strategies*. From 2000 to 2004 he served as the president of the Gifted and Talented Researchers in the American Educational Research Association. He is currently a professor at St. John's University in New York and was formerly a faculty member at the University of Pennsylvania in Philadelphia. Dr. Campbell has 30 years' experience as an educator. Among the gifted research community he is recognized as the originator of the International Academic Olympiad studies. E-mail: campbelj@stjohns.edu

Herbert J. Walberg, a distinguished visiting fellow at the Hoover Institution and a member of the Koret Task Force on K–12 Education, taught for 35 years at Harvard and the University of Illinois at Chicago. Author or editor of more than 60 books, he has written extensively for educational and psychological scholarly journals on measuring and raising student achievement and human accomplishments. He was appointed as a member of the National Assessment Governing Board and the National Board for Educational Sciences and as a fellow of several scholarly groups, including the American Association for the Advancement of Science, the International Academy of Education, and the Royal Statistical Society. He has lectured to scholars and policy makers in eight countries and is a trustee of the Foundation for Teaching Economics. E-mail: hwalberg@yahoo.com

Fonte: Roeper Review, v. 33, n. 1, p. 8-17, 2011. [Base de Dados]. Disponível em: <http://web.ebscohost.com>. Acesso em: 9 fev. 2011.