Support for Mathematics in Vietnam

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There are four basic reasons why Vietnam should support both theoretical and applied mathematical research.

1. **Mathematics plays a key role in economic development.** All of mathematics is richly interconnected, and so it is hard to predict which branches of mathematics will yield the most important economic benefits in the future. For example, I was trained at Princeton University in a highly abstract branch of mathematics, and my thesis advisor has never worked on applied problems. However, about 10 years after receiving my PhD, I started applying my knowledge to the emerging field of data and computer security. For over a quarter century all of my work has been in applied areas.

Similarly, the famous Vietnamese mathematician Hoàng Tụy received his PhD in Moscow in pure mathematics, working with Soviet mathematicians who did not work in applications. However, he later did pioneering work in a branch of applied mathematics – called optimization theory – that is concerned with finding the most efficient ways to organize logistical tasks in production, transportation, and communication.

2. **Mathematics is a central part of human culture.** Mathematics – like music, art, and literature – is a language of human thought and culture. When a youngster from Vietnam wins a medal at the International Mathematical Olympiad – for example, when Ngô Bảo Châu won gold medals two years in a row at age 16 and 17 – the Vietnamese people are rightfully proud, because first of all this means that their country's reputation is very high in mathematics, and second of all it shows that the younger generation is prepared to make fundamental contributions to the world's mathematical knowledge.

Conversely, a country that does not make original contributions to mathematics is like a country that has no music, or no art, or no literature of its own.

3. **Vietnam already has a strong tradition to build upon.** Mathematics in Vietnam goes back to ancient times. Over five hundred years ago in Hanoi the name of Lương Thê Vinh, an expert in geometry, was inscribed on a stele of honor in Văn Miếu. Over sixty years ago, during the war against French colonialism, the Việt Minh published a geometry textbook written by Hoàng Tụy for schools in the liberated zones. I know of no other case anywhere in the world where a guerrilla press in the jungle published a math book! And of course the most recent example of the strength of the mathematical tradition of Vietnam was the awarding of the Fields Medal to Ngô Bảo Châu at the 2010 International Congress of Mathematicians.

4. **A strong mathematical research community will stimulate mathematics education.** In America we use the term "gateway" to refer to mathematics, because young people need to have a high level of mathematical training in order to enter and succeed in any of the STEM fields (science, technology, engineering, and mathematics). The improvement of education in mathematics at all levels – elementary, secondary, undergraduate, and post-graduate – is important for a country's future technological and economic development. Research mathematicians can play a leadership role in improving the teaching of mathematics.

We now have to ask a different question – Is government support for the Vietnam Institute for Advanced Study in Mathematics (VIASM) an effective way to support the development of mathematics? In particular, how can one ensure that money is not wasted, and that the Institute doesn't become an elitist showcase that brings little benefit to the country as a whole?

I am very concerned about the danger of wasting the government's money on flashy but ineffective projects. For example, I sharply criticized the proposal of the U.S.-Vietnam Education Task Force that the Government of Vietnam give USD 100,000,000 to a consortium of American colleges to build and administer a new "American-style" university in the south of Vietnam. I also opposed the so-called "Advanced Program," in which the Government of Vietnam has paid large sums to American professors to spend a few months in Vietnam teaching advanced undergraduate courses. In both cases I argued that the money should instead be spent improving salaries, working conditions, and educational facilities at Vietnam National University and the other government universities.

Similarly, I believe that in the case of VIASM money should mainly be spent within Vietnam. Except in rare cases, Vietnam should not pay foreigners generous stipends and should not pay for their international travel. Visiting mathematicians should be using their sabbatical leaves and grants from their own governments. The VIASM should not routinely supply them with anything more than local hospitality – a room in a guesthouse, for example. On the other hand, VIASM should be generous in supplying sabbatical opportunities for professors at Vietnam's universities whose research program can benefit from time away from teaching and from the excellent research environment at VIASM.

In addition to wasting money, there is a second pitfall that must be avoided. The VIASM must not become an elitist institution divorced from the reality of Vietnam. In many countries institutes of this type devote their energy to cultivating international ties and prestige, and are not much involved with the internal development of their own country. For example, in Mexico the generously-funded institute CINVESTAV (Center for Advanced Research) has been criticized for its lack of ties with or support for Mexican scientists at other institutions. Two years ago CINVESTAV organized an international conference in my field, and I later learned that my colleagues at Mexican universities were never invited or even informed about the conference.

The danger of elitism is great unless specific measures are taken to prevent it. There are several ways that the VIASM can become integrated with education and industry for the benefit of Vietnam.

1. **Supporting university mathematics.** The VIASM should work closely with all the government universities to help mathematics faculty improve their level of research and teaching. The Institute should provide sabbatical opportunities to university faculty. In addition, when Vietnamese mathematicians get their PhD's abroad, the VIASM can play an important role in attracting them back to Vietnam, first to spend a year at the Institute and then to join the faculty of one of the public universities. In this way, the VIASM can help strengthen the universities and prevent a "brain drain."

The leading research mathematicians connected with VIASM should lobby the government to improve conditions at VNU and other public universities. Efforts to increase funding of VIASM itself should be a lower priority than efforts to improve the conditions

at the universities.

2. **Working to improve the teaching of mathematics at all levels.** The VIASM should develop ties with secondary and undergraduate students as well as with postgraduate students, and should help advise the government on questions of teacher training and curricular materials.

3. **Encouraging young people to enter the mathematical sciences.** The VIASM should organize special programs for youngsters who do well in the national and international math olympiads in order to attract them to work in basic science and mathematics. Too many of those students end up going into the business world and wasting their talents.

4. **Supporting gender equity in mathematics.** Vietnamese women are severely under-represented in the mathematical sciences. The VIASM should work with the Vietnam Women's Union to organize special programs for talented girls in mathematics.

5. **Working with industry.** The VIASM should encourage mathematicians to consult for industry, and at the same time should attempt to provide some level of quality control. That is, applications of mathematics in industry must be based on a solid scientific foundation and not on wishful thinking. The general public and industrial leaders should not be given an exaggerated picture of what mathematics can do.

Many mathematicians have great hopes for the Vietnam Institute for Advanced Study in Mathematics under the leadership of Ngô Bảo Châu. We have noticed several points of comparison between Ngô Bảo Châu and the legendary Chinese mathematician S. S. Chern, who, while director of the Mathematical Sciences Research Institute at Berkeley in the U.S.A., worked tirelessly and successfully to build up mathematics in China. We believe that Ngô Bảo Châu, like Chern before him, will prove to be a talented administrative leader as well as a brilliant mathematician.

When we look at the prospects for math and science in Vietnam, there are serious problems but also reason for hope. To mention just one of the frustrating problems, university professors hardly ever meet with students outside of class for office hours or special projects. They often work at a second job and have no time, and in any case they usually have no office space for consultations. This is one consequence of the low salaries and poor facilities at the public universities.

But there is reason to be hopeful. Vietnamese young people have a very high international reputation for being studious and well-prepared. Even back in the 1970's, when I first encountered Vietnamese students in Moscow, the Russians would always speak of them as being the best of all the foreign students in the Soviet Union. Vietnamese families have traditionally put a high priority on education, and have imparted high standards to the next generation.

Vietnamese teachers – in the schools as well as universities – are also very dedicated and hard-working. Vietnam has a great reservoir of human resources to draw upon. If the leaders of government and science spend money wisely, they can stimulate great improvements in education, science, and technology.