

PROFILE OF SELECTED FILIPINO SCIENTISTS: SOCIOCULTURAL AND PERSONALITY CHARACTERISTICS

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Abstract

This study looked into the personality, family background, education and training, special qualities, and the process of research conceptualization and production of forty-two outstanding Filipino scientists. Using an auto-biographical technique, the researcher found out that most were males, of middle class origin, with at least one parent who was a strong influence in their lives. They were bright if not superior in intellectual abilities. Among the factors that influenced their choice of a science career – a parent or member of the family, scholarships, interest in and or abilities in science and mathematics, community, the most profound was a teacher or a mentor. Among the common qualities of Filipino scientists were strong inclinations for order and discipline, a desire for closure, and habits of personal leadership and management. They had a strong desire for intellectual adventure, and along with a patriotic spirit, a strong sense of mission. The processes of association, imagination, and “piling up of ideas”, were evident in the conceptualization and production of research. The scientists also explored extensions, variations, and missing gaps of previous researches. Writing and documentation were part of the efforts to pin down ideas and bring these to fruition. Pedagogical and policy implications were drawn from the study.

Keywords: Filipino scientists, scientific personality

Introduction

The importance of scientists needs no argument. Humanity profits from people who have the ability to isolate an antibiotic, to discover the healing properties of plants, to design an airplane, to rehabilitate the environment, etc. We will continue to be indebted to the men and women known as scientists. But who and what are scientists? How are they developed? Are there qualities of ability, family background, education and training that make them? Are there special qualities of personality and intelligence that mark the person for a career in science? These questions have practical importance considering the dearth of scientists in the Philippines and the difficulty of recruiting young people for science careers.

Early studies

Anne Roe conducted one of the earliest studies over a three-year period in the early 1950's (Roe, 1952). University committees all over the country as top ranking research scientists selected Dr. Roe's subjects. There were sixty-four of them all, averaging 48 years old. The most striking characteristic was a high level of intelligence. They likewise did extremely well on tests of spatial perception, mathematics, and verbal reasoning. As far as habits of thinking, there were some differences among the sixty-four scientists. All reported a considerable amount of abstract thinking, particularly at crucial points. In several aspects, the scientists' backgrounds differed very much from the population at large. There were no Catholics; five came from Jewish homes and the rest had protestant backgrounds. The economic levels were varied, ranging from very poor to well-to-do. Another striking fact is that 53 percent of the scientists were sons of professional men; not one was a son of an unskilled worker. Most of the scientists developed intellectual interest at an early age.

Thomas Sprecher (1963) accumulated a batch of critical incidents describing the characteristics of successful engineers at a major steel company. He analyzed and became convinced that creativity involves ideas, work habits and opportunity.

Methodology

The study settled on forty-two Filipino scientists who agreed to participate. There were 9 biologists, 1 medical doctor, 9 chemists, 7 physicists, 5 mathematicians, 8 agricultural scientists, 3 engineers, and 1 geologist. Thirty or 71.4% were males; twelve or 28.6 % were females. The scientists were members of scientific organizations and recipients of the "Outstanding Young Scientist Award" given by the National Academy of Science and Technology (NAST) of the Department of Science and Technology.

The autobiographical/biographical approach was the main research technique. An outline for an autobiographical essay was constructed by the researcher and evaluated by two research experts from the University of the Philippines. The scientists wrote structured autobiographies. Some opted not to write and allowed themselves to be interviewed by the researcher who audio-taped their life stories and reflections.

Results

Using an interpretive methodology, forty-two autobiographies were analyzed in the following areas: Family and Community, Education, Career Choice, Personality Characteristics, and Process of Conceptualization and Production of Research.

Community and Family Circumstances

Most scientists had their family origins in the regions of Luzon. Five (5) came from the regions of the Visayas and three (3) from Mindanao. The type of communities varied from very rural to very urban like Metro Manila.

Family circumstances likewise varied. Some scientists came from upper middle class families where in their younger years they trained in the musical instruments such as piano and violin. They went to Baguio or abroad for vacations and had books and encyclopedias in the family libraries in their younger years. Some scientists came from poor families where reading materials consisted of local comic books. They spent their childhood playing with neighbors in the farm. Most scientists however described their families as middle class. Thirty-six (85.7%) scientists had at least one parent, usually a father, who was employed or involved in a profession. Two had parents who owned and managed big farms. Six scientists had parents who farmed small piece of land or who were involved in small business, and considered their families in the lower economic status.

Early Education and Evidence of Precocious ness

Parents, siblings, and grandparents provided early education. "At 5 or 6 years old, my mother taught me how to count and read..." or "My mother read books to us before going to bed."

"My father was very disciplined with his time and the way he put things in order in the house. He was also a disciplinarian who expected all of us to follow a schedule for our chores, homework, and studies...my mother worked full-time running the household and making sure we did our homework, put in our study time, practiced the piano..."

While many scientists did not report evidence of precocious ness in early childhood, incidents narrated by some indicated signs of talents and giftedness.

"My memories included being complimented on holding the pencil correctly to write and draw at 2 years old; counting correctly very early..."

"As a child about 3 or 4 years old, I wondered about many things. For example: Which is longer, night or day?" When my sister answered, "about the same." Then I asked, "How come I do not get hungry at nighttime and eat three times during the day?"

"Why was I not born a deer?" "...If I was born a deer, I would probably have not known the difference. I would have been a happy deer, performing the task of a deer."

Elementary and High School Education

Thirty-five scientists or 59.5% studied in public schools during their elementary and high school, which included state schools and universities. Seventeen (17) or 40.5% studied in private schools. The scientists performed very well in their elementary and high school — majority excelled in mathematics and science. Many were mathematics and science contestants and won several awards. The scientists reported their interest in reading even in their early years.

"From Grade 3 till Grade 6, I was among the very few very frequent borrowers from our library..."

"I have always been preoccupied with books and readings..."

Several of them reported unusual interest in difficult subjects like mathematics and physics. Some scientists had vivid recollections of their teachers in the elementary and high school and were inspired by them in their studies and even in their personal lives.

"...my class adviser in Grade 7 impressed me with her love for social work. There was a small storage room near the staircase where we saw her scooping powdered milk, etc and putting them in plastic bags. We just watched her. Then she asked us if we wanted to help her distribute the bags. Thus, on some Saturday mornings, a big group of us walked to Ayala Bridge along the footpath leading to the shanties at the bottom of the bridge, just a few feet above the muddy waters of Pasig River. There we saw little rooms with large families occupying a few square feet of space for their home. We gave the bags and exchanged a few words with the occupants. (She) spoke simple English, unmindful of whether she was understood or not. Her smiling face was sufficient to relay her message."

College and Graduate School

For their undergraduate degrees, 31 or 73.8% of the subjects went to the University of the Philippines. The rest studied in private schools such as Ateneo de Manila, St. Theresa's College, University of Santo Tomas, Siliman University and some state universities in the Visayas and Mindanao i.e Mindanao State University, Southern Mindanao State University in Kabacan, and Leyte State College. College life was a mixture of varied experiences both academic and non-academic. These were mostly broad experiences and explorations about life. *"My college days were spent not only for academic but (also) for extra-curricular activities. I was member of the choir, talents club, and student council. I was also active in the sorority but managed to maintain my good grades despite all the distractions."*

It was also the time for fun, idealism, dreams, and discernment.

"In college, I found a special talent: getting good grades in exams. I collected problems from different books and references and set up "mock exams"...Problem solving became my hobby."

"...during my first year in college I was not doing well. I was basically having fun like (involving myself in activism). So my grades were atrocious. (When my father learned about it, he got angry)...that was my turning point. I decided to become serious with my studies."

"university life...was more than academics. I was very much involved in teaching catechism and in the student governments. We went to the poor, lived with the poor. Despite the flurry of activities, my academic standing did not waiver."

Despite many distractions, most scientists stayed focused, organized, and disciplined. Twenty-five or 60% were on scholarships and/or graduated with honors.

All scientists went to graduate school through scholarships or fellowships. The scholarships were obtained on the basis of any or all of the following: performance in school, topping exams, exemplary research work, and recommendations of administrators and mentors. In graduate school, the influences of mentors and advisers were very significant in developing not only their research skills but their vocation in science. All went abroad for their graduate degrees or research fellowships. Their training abroad strengthened commitments to their studies and research works.

"I owe quite a bit to my PhD mentor...I admired his energy and adherence to principles as well as appreciation for nature and genuine curiosity."

"My PhD mentor...taught me how to think critically, how to probe data for correctness, and how to follow-up experiments to prove one's hypotheses...I discovered how much work had to go into writing a good technical paper. I learned what it meant to write concisely and critically."

Career Choice and Development

Interest in science careers was brought about by the influence of parents, relatives, friends and teachers and even guidance counselors. Interest and abilities however played significant roles. The scientists reported unusual interests and abilities in science and mathematics as shown by these statements:

"Optics fascinates me; math as well... I knew I had this gift of science when I got a 100 in my physics class for the entire year..."

"I discovered my talent in mathematics in my second year high school...I answered algebra problems even if I didn't study...I just listened to the teacher..."

The type of communities likewise had an influence. One scientist took marine science because of the coral reefs in his hometown. For another, entomology... because it "would be like a 'playschool'" for I already knew so many insects in our farm."

Some events early on in the lives of scientists had provided opportunities to choose a science career as narrated below:

"In my senior year of high school, I had chicken pox and was absent from classes for sometime. I then read an American authored book which included a discussion of what goes on inside capacitors. Fascinated by the ability of physicists to explain such things as made me want to take up B.S. Physics..."

A very profound influence in the lives of scientists was the mentors, teachers and other scientists who served as role models. The scientists believed that their choice of science careers was due to the teachers who were the "epitome of good teaching". The mentors who influenced their careers were described as full of energy, highly principled, highly motivated, full of genuine curiosity, mastery, clarity and enthusiasm. To the young minds, these qualities brought motivation, enjoyment, discovery, wonder, amazement and inspiration. They also provided moral support. Some scientists recalled:

"My teachers in algebra and trigonometry were very impressive. They were the ones who planted the seed in me which is now becoming to be deeply rooted full-grown plant."

"My biology teacher inspired me to study life science because I was amazed by her broad knowledge of subject matter in biology."

"I attribute my own enjoyment (of science) to my excellent physics teacher... We had some home experiments and this made physics come alive... He was a most demanding man (quizzes everyday) but we did enjoy his class."

It was in college where most scientists crystallized their choice of science careers. Professors and mentors who were considered role models reinforced their choices.

They saw in them strength of character, dynamism, idealism, solicitousness, concern, the giving of oneself, leadership, vision and discipline.

"In college our teacher in organic chemistry...impressed me so much with her dynamism and idealism. She encouraged us to be research- conscious, to always wonder about possibilities. I felt the whole class was impressed so that I had thought that most of us would go to research, if not all of us. I also thought that if chemistry was not research, what else would it be?"

Some opportunities such as scholarships also led to the choice of a career in science. The scientists mentioned COFED and NSDB scholarships that prompted them to enroll in science courses.

"A great high school physics teacher plus the full 4-year NSDB scholarship made me chose the B.S. (Physics) course instead of what people around me previously thought I would choose – pre-law or journalism."

"My choice of undergraduate course was largely dictated by where I could get a scholarship..."

Personality

The scientists described their personality in various ways. Cognitive qualities such as intelligence, analytical and logical thinking, were common qualities among them. *"I consider as strong points my intellectual abilities in languages, science, and mathematics."*

They also indicated strong inclinations for order and discipline. "I am a systems person,..." wrote one physicist. A desire for closure was also apparent. *"I have an 'itch' (strong desire) to do what I have to do immediately."*

There was a strong sense of mission. Clear goals and the desire for intellectual adventure were strong motivating powers behind the passion and intensity of scientists. For many "...money was not much of a consideration..." As one scientist explained:

"It's about accomplishment. It's the feeling that (I) have done (my) best...I can show that even with the very difficult situation in the country, I can do a world-class research...something probably not done before..."

Along with "priestly devotion" were habits of personal leadership and management. They recognized that more than intellectual powers, scientific outputs largely depend on diligence, perseverance, discipline, and hard work. One scientist humbly wrote... *"It really was the 'sipag and tiyaga' (diligence and perseverance) rather than unusual intelligence that gave me honors and awards."* It also meant keeping going and not giving up easily. "I never give up..." said another. When "...nine out of ten experiments don't work...", the maxim "try and try again" is no truer for anyone than a scientist.

For many scientists, service to humanity and the country pervades their scientific life. Many of them turned down lucrative job offers abroad for service to the country. A lady physicist reflected *"...up to the present time, (my spouse and I) have maintained a patriotic spirit in all our professional endeavors."*

Conceptualization and Production of Research Outputs

The scientists put together in association, their interests and needs, previous experiences, and knowledge attained through reading published researches and attending conferences here or abroad. *"So far conceptualization and production of research work has been through reading books and journal articles and listening to conference talks..."* The scientists further explored extensions and variations in content and methodologies. The scientists likewise looked for the missing and tried to fill the gaps.

Imagination also played a role in the production of research. One scientist clearly identified this aspect of creative work. *"I have developed technology intelligence to the point that I can imagine the trade secrets of some devices or processes..."*

The piling up of ideas was noted in the activities or behavior of scientists. These included collecting references and researches along fields of interest and studying and thinking through ideas. Analysis, verification and putting together the pieces were also identified as important steps in their thinking behavior.

The conceptualization and production of research projects or any creative work put prominence on study, work, and perseverance. All scientists reported the amount of study, labor and discipline that went into their work as scientists and as students of science. Writing and documentation were part of these activities. As one scientist put it: *"Very rarely does one achieve success without hard work and persistence..."* or *"...nothing substitutes hard work."*

Conclusion

Based on forty-two autobiographical data, the scientists differ greatly as individuals. Certain common characteristics, however, appear. A generalized picture of a Filipino scientist is presented.

The Filipino scientist was most likely a male. He belonged to a middle class family. His father was in the profession and employed as an engineer, accountant, lawyer, medical doctor, professor, etc. His mother was a teacher or a housewife. At least one parent was strict, strong-hearted and a strong influence in his life. The circumstances in his life brought about by a middle class upbringing gave him an academic orientation. These circumstances involved among others, the value placed in education, the academic orientation of the parents, the determination to improve one's economic conditions, and the opportunities for a college education and scholarships.

The scientist was bright if not superior in intellectual abilities. There were evidence of precociousness in his early years. His years in the elementary and high school were spent in a public or private schools. He tended to get high grades in all subjects especially in science and mathematics. He was interested in reading even in his early years. He joined academic contests and received academic awards as early as the elementary.

It was in high school when he began to discover his talents in mathematics or science. It was also in high school that interests in mathematics and science careers started to develop. The teachers contributed greatly to this stage of development. It was in college that his career choice in the sciences crystallized. The most profound influence were the professors who were described as "epitome of good teaching and models of excellence and good behavior." All scientists had PhD degrees and went abroad for further studies. Graduate schools honed their research capabilities and strengthened their devotion to their careers.

The Filipino scientist was intellectually superior or at least above average. He had a strong sense of mission. While he acknowledged the importance of money, he was more strongly motivated by the need to accomplish and to contribute to intellectual endeavors. Their habits of personal leadership and management put prominence on study, hard work, discipline and perseverance. This is contrary to the popular idea that inspiration, relaxation and eccentric behavior characterize the scientific person.

His thinking process and conceptualization of research involved the process of association, imagination, and the piling up of ideas. Also identified were the process of analysis, verification and confirmation, along with writing and documentation. The scientist likewise explored extensions and variations in content and methodologies of published researches. He also looked for the missing and filled the gaps. There was no formula in his conceptualization or thinking process. One thing is sure, there was a lot of effort to pin down ideas and bring this to fruition.

Implications

This study supports some known facts and theories about the development of the scientific personality. The interplay of nature and nurture is evident. The family, teachers, mentors, and events in their lives are important factors in the development of the Filipino scientist. The roles of models and mentors have significant implications. Who the Filipino models after is everyone's concern – policy makers, educators, and the various sectors of society.

The scientists' habits of personal leadership and management which puts prominence on study, perseverance, and hard work, tend to dispel some popular notions about creativity. Pedagogical implications may be drawn on how to foster creativity among young people.

It takes effort to produce a scientific output, much more the scientific personality. Our best hope is to harness our wills and do it. The challenge confronts us all.

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