Optics education in the Republic of China on Taiwan toward tomorrow's economic miracle

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ABSTRACT

The economic miracle of the Republic of China on Taiwan has been mentioned. Factors of her economic success have been analyzed. Education is one of the main factors been attributed. Optics education which has been described is considered as the principal source of her success in the future toward tomorrow's economic miracle. The Institute of Optical Sciences of the National Central University was introduced.

1. INTRODUCTON

The marvellously economic success of the Republic of China on Taiwan is a miracle. With population about 20 millions and land size less than 14,000 square miles, Taiwan is ranked 41 and 123 in population and land size respectively in the about 200 territories and is one of the most densely populated areas of the world. But she is the world's eleventh largest trading nation with gross national product (GNP) more than 110 billions, rated 25th, per capita GNP US$6,000, rated 32 and foreign reserve up to 74 billions, second to Japan[1-2]. These successes were attributed mainly to education. Optics education is expected to develop tomorrow's economic miracle.

2. FACTORS OF TAIWAN ECONOMIC SUCCESS

There are many factors can be attributed, but we just mention three of the main ones:

2.1. Political stability

Even we are preparing defense daily, but for long time not only there was no war from outside, but also no riot or disturbance inside.

2.2. People's diligence and thrift

Diligence and thrift are two traditional Chinese characters. Diligence has brought the blessing of prosperity and opportunity. And thrift has brought the abundance and growth.

2.3. Education

Education can provide everything, especially it develops and upgrades the skilled man power which not only is the main source for today's economic miracle but also will be tomorrow's economic miracle of Taiwan.

2.3.1. General education. Public education of Republic of China on Taiwan today is compulsory for nine years, and nearly 30% of the population are students. The rate of primary school graduates enrolled in junior high schools was 100%. The rate of junior high school graduates enrolled in senior high schools was over 77%. The rate of senior high school graductes enrolled in schools of higher education was over 85%. Because of Confucian tradition, the Chinese have the deepest respect of education. The number of institutions of higher education was given in Table 1.[3]

Table 1. Number of Institutions of Higher Education

Schools	Number	Remarks
Universities	16	
Colleges	23	(Affiliated institutes)
Junior Colleges	68	315
Total	107	

2.3.2 Education philosophy. Education philosophy is central control. Ministry of Education takes most the responsibility. National Science Council and Academia Sinica are two other leading and control organizations.

3. OPTICS EDUCATION

Electronic products are the top of the ten major trade items which gave us the economic miracle today. To plan for the future we should predict, plan and develop the major trade

items. Optical products item is the principal one of them. Optics man power, therefore, optics education is needed.

3.1. Government policy of optics education

Electro-Optics being one of the eight strategic technologies was government policy initially proposed in 1982. Dr. K. T. Lee, the Ex-Minister of Finance was the policy maker. In the World Business section of an issue of News Week years later, there was an exclamatory topic: "Now, the Age of Light!" Dr. Lee has foreseen it. The forseer gave the right guidance through the Electro-Optics Science & Technology Committee, National Science Council of the Executive Yuan.

3.2. Current optics education

There are four kinds of optics education currently:

3.2.1. Graduate education. There are two institutes in two universities, plus effects in electrical engineering departments and physics departments in five universitites which have graduate education.

3.2.2. Instructor's training for electro-optics education in junior colleges. This training is the make-up of the shortage of instructors for optics education in junior colleges. Up to now, two terms have been made.

3.2.3. Junior college education. There are three junior colleges to train optics technicians and more colleges move toward it.

3.2.4. Optomitrist training. There is no regular school for training of them. The two instutes in universities temporarily take the responsibility.

4. INSTITUTE OF OPTICAL SCIENCES OF NCU

Founded in 1982, the Institute now offers both M.S. and Ph.D. degrees. The faculty consists of 9 full-time and 16 part-time professors. They include 7 Ph.D.'s from University of Arizona, 3 Ph.D.'s from University of Reading and one Ph.D. from Imperial College. Part-time professors teach courses, do joint researches or guide students. The student body this year comprises of 55 M.S. and 11 Ph.D. students. Each year, we admit 25-30 students to the M.S. program and about 5 students to the Ph.D. program. Approximately half of the students have physics background. The other half are engineering graduates, mostly electrical engineering.

The Institute has 20 teaching and research laboratories. Eighty percent of the researches are experimental.

30 to 35 courses are offered each academic year. Curriculum emphasizes both on basic knowledge of optics as well as the research topics of the faculty members. Students are also encouraged to take courses in other departments to broaden their background.

4.1. Courses

Since our faculty has several members who graduated from Optical Sciences Center (OSC) at the University of Arizona, we follow the OSC spirit. Courses which are given each academic year are list below:

4.1.1. Fundamental courses.

1).Foundamental Optics
2).Geometrical Optics
3).Fourier Optics
4).Electro-Optics
5).Optical Detection Electronics
6).Electromagnetic Fundamentals of Optics
7).Optics Experiments

4.1.2. Advance courses.

8).Fiber Optics
9).Interferometry
10).Introduction to Lasers
11).Optical Materials and Instruments
12).Holography
13).Radiation and Detection
14).Infrared Technology
15).Optical Data Processing

16).Thin Film Optics
17).Lens Design
18).Optical Fabrication
19).Image Processing
20).Integrated Optics
21).Optical Inspection and Measurement
22).Laser Spectroscopy
23).Nonlinear Optics
24).Optical Testing
25).Optical Communication
26).Optical Fiber Sensors
27).Optical Coating
28).Modern Optics Experiments
29).Moire Techniques
30).Signal Analysis and Fast Fourier Transform
31).Computer Interface for Optics
32).Geometric Optics Experiments
33).Fourier Optics Experiment
34).Special Topics on Physical Optics
35).Optical Engineering

4.2. Laboratories

1).Optical Experiments (teaching lab.)
2).Optical Design Room
3).Optical Fabrication Laboratory
4).Glass Shop
5).Coating Laboratory
6).Optical Testing Laboratory
7).Interferometry Laboratory
8).Photography Laboratory
9).Holography Laboratory
10).Nondestructive Testing Laboratory
11).Optical Pattern Recognition Laboratory
12).White Light Optical Data Processing Laboratory
13).Holographic Optical Elements Laboratory
14).Fiber Optics Laborataory
15).Optical Fiber Sensors Laboratory
16).Infrared Systems Laboratory
17).Laser Applications Laboratory
18).Optical Inspection and Measurement Laboratory
19).Image Processing Laboratory
20).Automatic Measurements Laboratory

4.3. Environment

The environment related to optics is given in the following.

4.3.1. Inside the university.

1).Physics Department
Raman Scattering
Nonlinear Optics
Modulation Spectroscopy
2).Mechanical Engineering Department
Laser Material Processing
Optical Inspection and Measurement
3).Center for Space and Remote Sensing Research
VHF Radar
Satellite Remote Sensing
Photogrametry
Atmospheric Radiation

4.3.2. Nearby.

1)Telecommunication Laboratory
2)Chung Shan Institute of Science and Technology
3)Industry

4.4. Conclusion

4.4.1. Steadily growing. Our Institute expanded to Center last year. We have new building with huge space.

4.4.2. Specialitites established.
1).Measurements and Inspection
2).Optical Engineering
3).Optical Data Processing

4.4.3. Closely related to industry.

5. INTERACTION WITH INTERNATIONAL COMMUNITIES

Through the following means, the Institute and the Center actively interact with international academic communities:

5.1. Joint research projects.

5.2. Bilateral seminars, symposia, and workshops.

5.3. Scientist and information exchanges.

5.4. Tutorial and engineering updated courses

We plan to invite those instructors to give those courses in Taiwan.

To optics experts and scientists in general, we would like to show our hospitality at least with accommodation when they have chance to visit Taiwan.

Please visit us and contact:

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6. CONCLUSION

Through optics education, we hope to have enough optics industry manpower. Then optics products can replace electronics products as the top of the ten major export items. The goal of our government policy to develop tomorrow's economic miracle can be reached.

In the meantime, we hope our Institute to have international reputation and to be able to admit foreign students for graduate studies in the near future. That is glory to Optical Sciences Center of University of Arizona, who spread the seeds.

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