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**Effective Policies for Supporting Education and Employment of Women in Science
and Technology**

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ABSTRACT

Human resources have played a crucial role in the Republic of Korea's economic growth. Men have taken up most of the economically active population, however, and this male dominance has been more pronounced in

Girls represented about 35 per cent of high school students studying science subjects.

Tables 1 through 4 show the status of students by S&E Note: Associate95.fers to a degree offered by a two or th

Total (2,052)	10,738	1,821 (17.0)	5,461	1,659 (30.4)	16,199	3,480 (21.5)
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Source: Report of the 2009 Investigative Research on the Actual Status of Utilizing of Women in S&T, NIS WIST, MEST (2010)

Table 4. Total employment of S&T women personnel in R&D sectors (2008)

Unit: No. of institutes, No. of persons, per cent

Sector (No. surveyed)	Status	Regular		Non-regular		Total	
	Total	Female (ratio)	Total	Female (ratio)	Total	Female (ratio)	
University (277)	24,967	2,939 (11.8)	53,439	16,217 (30.3)	78,406	19,156 (24.4)	
Public Research Institute (172)	22,094	2,658 (12.0)	7,412	3,183 (42.9)	29,506	5,841 (19.8)	
Private Research Institute (1,603)	81,844	7,846 (9.6)	545	223 (40.9)	82,389	8,069 (9.8)	
Total (2,052)	128,905	13,443 (10.4)	61,396	19,623 (32.0)	190,301	33,066 (17.4)	

Source: Report of the 2009 Investigative Research on the Actual Status of Utilizing of Women in S&T, NIS WIST, MEST (2010)

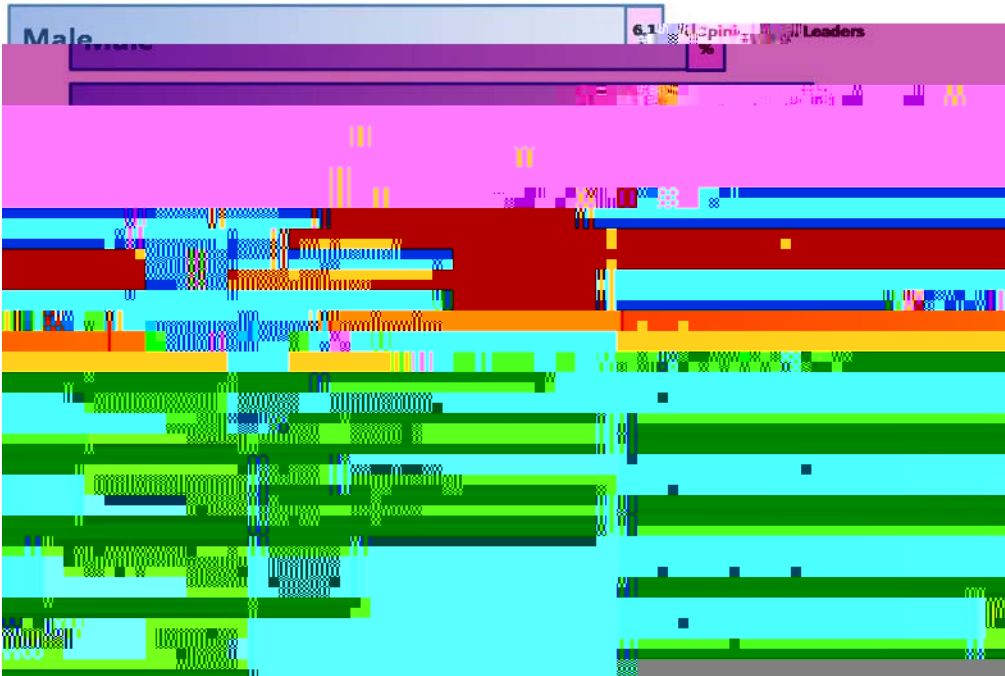
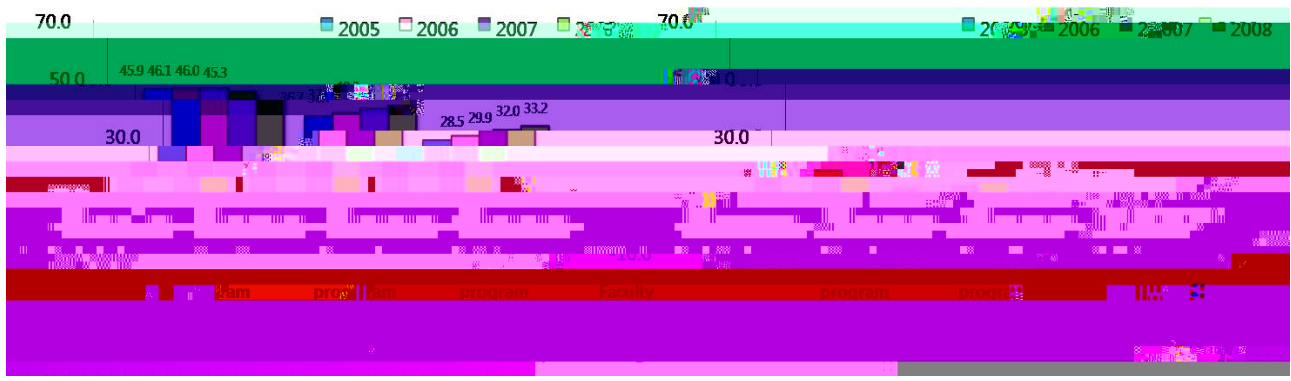


Fig.1 Diagram of sex ratio in S&T from high school to opinion leading stage (2008)



Female

Male

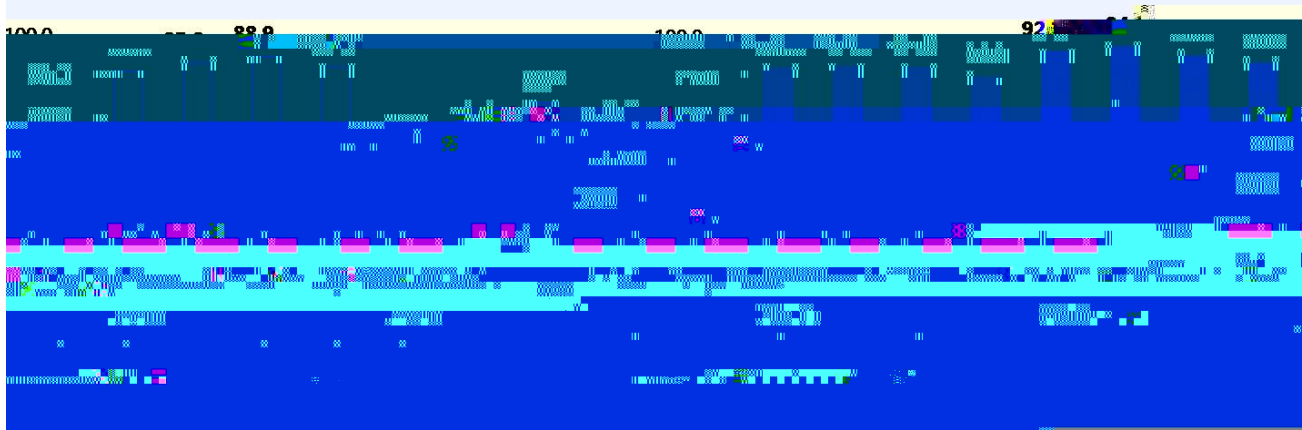


Fig.3

- Low ratio of women earning S&E doctorates
- Low rate of economic activity participation by women
- High ratio of temporary workers among women S&T employees

Opportunities:

- Inadequate human resources in S&T
- Need for development of source technology and diversity
- Shortage of eunii -1.224 e among h224 e amipat women

women graduates with S&E doctorates was 762 in 2008, and the plan is to raise that number to 1,000 by 2013.

2) Recruitment Target System for women scientists and engineers

The Recruitment Target System (RTS) for women scientists and engineers was adopted in 2001 by the National Science and Technology Council (NSTC) under a presidential decree and applied to 25 government-funded S&T institutes. Since 2003, just after the Act on Fostering and Supporting Women Scientists and Technicians took effect, all 98 national and governmental S&T institutes have become targets of this policy. The RTS is under the supervision of the Ministry of Education, Science and Technology, and the aim is to increase the average rate of women recruits by the 98 institutes to 30 per cent by 2013, when the second Basic Plans for Fostering and Supporting Women in Science and Technology will end. The 98 institutes must report their hiring data to the NSTC every year. The rate of women recruits increased from 18.2 per cent in 2003 to 26.6 per cent in 2009. The 25 government-funded institutes that set their own targets performed well by raising their average rate from 10.4 per cent in 2003 to 19.7 per cent in 2009. Since 2009, the Minister Awards of the Ministry of Education, Science and Technology are given to outstanding institutes.

The RTS was also applied to 23 national and public universities. Between 2003 and 2005, the former Ministry of Education and Human Resources Development allocated 200 new faculty positions for women only in all fields. This policy resulted in a significant increase in the female faculty rate from 9.2 per cent (5.2 per cent in S&E) in 2003 to 10.7 per cent (6.5 per cent in S&E) in 2005. Since 2005, the rate of female recruits to new faculty has gradually increased to 12.2 per cent (7.4 per cent in S&E). Despite an increase in the number of women with doctorates, the failure to allocate new faculty positions to women has resulted in a slower increase in the rate.

3) Promotion Target System for women scientists and engineers

Since 2007, the Promotion Target System (PTS) has been recommended to 25 government-funded S&T institutes with the goal of having women comprise 30 per cent of those promoted. The percentage of women promoted is not that discouraging if the percentage of female candidates for promotions is considered (See Table 6). The lack of women scientist and engineer candidates is expected to ease in the coming decades considering that 20.6 per cent of senior researchers are women who will be candidates for director sooner or later. Yet women scientists and engineers say the PTS must be applied to all 98 national and governmental S&T institutes if policies for supporting women in S&T are to be effective.

Table 6. *Percentage of women candidates and promotions*

Unit: per cent

Type/Year	2007		2008		2009	
	Candidates	Promoted	Candidates	Promoted	Candidates	Promoted
To Director	6.7	8.4	7.5	7.3	5.1	4.0
To Senior Manager	20.6	15.2	21.3	22.9	21.0	17.9
Total	11.7	11.5	12.7	14.4	9.9	9.5

4) Designation of officer in charge of women scientists and engineers

To improve the working conditions and environment for women scientists and engineers, governmental organizations with 30 or more women scientists and engineers as regular employees are required to designate a senior officer in charge of women employees. The target organizations are government-funded or invested national/public institutes and universities. A combined 23 institutes and 10 universities are target organizations.

The officer monitors, consults, diagnoses, and reports everything on promoting women employees. He or she is also educated and trained twice a year to maximize the effectiveness of the mission.

Most of such officers are men, however. Moreover, supervising women employees is not the only duty for the officers. For successful performance of the officer's mission, diagnosis indices for gender equality have been developed to let the officer diagnose his or her organization. Four of the indices are equal employment, equal opportunity, family friendliness, and affirmative action measures. Each category has four to five sub-indices. The qualities of equal employment and family friendliness at institutes are higher than at universities, while institutes are scored lower in equal opportunity and affirmative action. The higher the scores of the quality and implementation of the measures, the more gender equality there is. The scores of such measures slightly increase every year at most target organizations.

5) Exclusive research funds for women scientists or engineers

To encourage women scientists and engineers to stay on as researchers and to foster outstanding female talents in S&T, an R&D budget has been exclusively allocated for women scientists since 2000. The budget began at US\$2.5M in 2000 and reached US\$15.7M in 2010. On average, about 30 per cent of applicants receive funds, though the overall budget has significantly increased. The ratio of women project managers more than doubled from 6 per cent in 2003 to 14 per cent in 2009. A Point Award System, which gives extra points to women researchers or those returning from maternity leave, and a quota system in which 14 per cent of project managers must be women were adopted for use in general research funds.

6) Childcare center at Daedeok Research Complex

The childcare center (nursery school) at Daedeok Research Complex in Daejeon was built for women scientists and engineers not by the Ministry of Gender Equality but by the former Ministry of Science and Technology. The complex has 20 per cent of the country's women scientists and engineers. The nursery school can accommodate 300 babies and toddlers between the ages of 15 and 60 months. It is open from 7:30 a.m. to 10:30 p.m. Women scientists and engineers from 37 institutes inside the complex who use this nursery school have expressed a high level of satisfaction. The nursery school gets subsidies from institutes having employees using the nursery school.

7) Institute for Supporting Women in Science and Technology

Article 14 of the Act on Fostering and Supporting Women Scientists and Technicians defines the foundation, duty, and management of a working center, namely the Institute for Supporting Women in Science and Technology (ISWIST). The center is tasked with carrying out research in policy development; educating, training, and consulting with women in S&T; providing information on employment; and supporting organizations of women scientists and engineers. The Republic of Korea has one national institute in Seoul (NIS-WIST) and one each in Gwangju (GJIS-WIST), Busan (BIS-WIST), Daejeon (DCIS-WIST) and Daegu (DGIS-WIST) that provide nationwide coverage. NIS-WIST is responsible for the planning and steering of policy initiatives. About US\$2M in government funds is allocated to these action centers each year.

ISWIST's mission is to foster women professionals in science and technology from the start of their employment to their becoming leaders in the S&T workplace. The most meaningful project is an annual investigation of the actual status of women in S&T. The report is the country's unique survey on gender recognition in S&T and provides a statistical database for policy development. The report is approved as a national statistic by Statistics Korea. Through this investigation, the matter of women employees in the R&D sector taking mainly temporary positions was first raised and is now well known to policymakers and the public. ch planPiD-2(e c)T9of wo

ISWIST is offering various training and supporting programmes to individuals. These include job training as a professional science communicator and lab manager, communication skills, S&T management, leadership training, and development of research ability. About 1,000 women science communicators have been trained and about 70 per cent of them work as afterschool science teachers, science writers, and screenwriters, producers, and actresses of science plays. About 200 women lab managers have been trained for supporting research laboratories mainly at universities. About 70 per cent of them work at university research laboratories nationwide. About 10,000 women scientists and engineers have participated in the training programmes since 2005.

Non-governmental organizations (NGO) of women scientists and engineers have received financial support for national or international activities in their social and academic networking. The Association of Korean Women Scientists & Engineers (KWSE), which is the first NGO for women scientists and engineers in the Republic of Korea, organized a successful international conference initiated to launch INWES-ASIA. INWES stands for International Network of Women Engineers and Scientists. A KWSE member will serve as the next president of INWES.

The WIST-FIT (Women in S&T - Friendly Institutional Transformation) project, benchmarked from the ADVANCE programme of the United States of America's National Science Foundation, was launched in 2004 to support S&T organizations willing to promote women employees and develop a work environment conducive to family life. Six national and four private universities and 14 public R&D institutes have participated in this project. Kyungpook National University has seen the most outstanding result under this programme and has been named the Best Gender Equality University by the Ministry of Education, Science and Technology. Not only that, the ratio of women out of the university's faculty increased from 10 per cent to 12 per cent. In addition, 19 per cent of chairpersons and 22 per cent of committee members were women though women comprise just 12 per

System, and Promotion Target System should be run concurrently.

Exclusive research funds for women scientists and engineers

This policy is especially encouraging for young women scientists and engineers who experience maternity leave or childrearing. Balancing family and research remains a huge obstacle to the success of women scientists and engineers. Research funds that are exclusively for women scientists or engineers can help them continue their research, overcome breaks in their research careers, and help them develop into leading scientists.

Childcare center at Research Complex

The former Ministry of Science and Technology had the great idea to build a nursery school running for 15 hours, though less than 10 per cent of children on average use the night-care programme after 7:30 p.m. A strong need exists to build new nursery schools for women scientists and engineers.

Institute for Supporting Women in Science and Technology

One of the most effective policies is the legal establishment of the action center for monitoring, steering, planning and implementing governmental policies and programmes for women in science and technology. ISWIST has focused on maximizing employment of women in science and technology in parallel with the 3W projects, which have focused on education of girls to major in S&E and build their careers in science and technology. The Korean government will soon merge the 3W projects into ISWIST so that diverse and custom-made programmes can be provided systematically and efficiently to young girls, female students majoring in S&E, women scientists and engineers, and even women leaders in science and technology. The consolidated ISWIST will be launched in January 2011 with an annual budget of US\$5M.

From the mid 1990s, a series of policies to provide equal opportunities for women in the workplace were enacted. They emphasized the importance of “gender mainstreaming” as a key aspect of national policy strategy. When the recruitment target system for women scientists and engineers was announced by the Minister of Science and Technology in 2001, however, the official homepage of the Ministry of Science and Technology was once paralyzed because of disputes and objections made by men against reverse gender discrimination. Despite governmental efforts, the OECD’s Reviews of Innovation Policy in the Republic of Korea still recommends that the Republic of Korea encourage more women to pursue science and engineering careers (OECD, 2009). It is more discouraging that the country’s gender gap index is 115th among 134 countries according to the Global Gender Gap Report 2009 of the World Economic Forum (WEF). Data cited in the report showed that the Republic of Korea’s female-to-male ratios (1.00 = equality) to be 0.71 in labour force participation; 0.67 in enrollment in tertiary education; 0.66 in professional and technical workers; 0.52 in estimated earned income; 0.16 in parliament; 0.10 in legislators, senior officials, and managers; and 0.05 in ministerial positions.

The most effective policies cited above are affirmative action for women scientists and engineers. Governmental policy must not stop at declaration, however. Strict policy enforcement, requirement of qualitative and quantitative outcomes, and incentives to encourage best practices are essential to maximize the effects of affirmative action.

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