

SHIMIZU Yasutaka, "Research of Designing Microwave Absorber, Temperature Stable SAW Substrate and Educational Technology"

1. Biography

1940-4-4 Birth, 1964-3 Graduated from Electrical Engineering
Department of Tokyo Institute of Technology
1966-3 Graduate School of Science and Engineering Master's course
Completed, Tokyo Institute of Technology
1970-4 Research Assistant of Electro-Physics Department, Faculty of
Engineering, Tokyo Institute of Technology
1971-2 Doctor of Engineering, Tokyo Institute of Technology
1972-10 Post-Doctoral Fellow at Polytechnic Institute of Brooklyn (until 1973-9)
1973-2 Associate Professor, Center for Research and Development of Educational Technology
1985-5 Professor, Center for Research and Development of Educational Technology
1994-3 Director, Center for Research and Development of Educational Technology
1996-5 Professor, Graduate School of Decision Science and Technology
1997-10 Professor, National Institution for Academic Degrees (until 1998-3)
2005-1 Doctor Honoris Causa, National School of Political Studies and Public Administration,
Bucharest, Rumania
2006-8 Guest Professor of Peking University, Peking, China (until 2008-8)
1998-3 Dean, Graduate School of Decision Science and Technology
2008-12 Honorary Professor of Northeast Normal University, Changchun, Jilin Province, China
2000-3 President, Japan Association for Educational technology (until 2003-3)
2001-4 Professor Emeritus, Tokyo Institute of Technology
2001-4- Director, Educational Resources Research Center, National Institute for Educational
Policy Research (until 2006-3)
2001-6 President, Japan Society for Educational Technology (until 2005-6)
2004-4 President, National Institute of Multimedia Education (until 2009-3)
2009-7 Auditor, Tokyo Institute of Technology (until 2006-3)
2010-6 President, Association for Promotion of Satellite Education (until 2011-3)
2016-4 Senior Adviser for President, Tokyo Institute of Technology (until 2018-3)

Award : SHIMISU Yasutaka received Yonezawa Memorial Academic Encouragement Award from Institute of Electronics and Communication Engineers(1969), IEEE Fellow(1992), Best Paper Award from Japan Society for Educational Technology three times(1994,1996 and 2009), Achievement Award from Association of Educational Technology(1994), IEICE Fellow, Society Award from Japan Society for Educational Technology(2010). He also received the Educational Minister's Award for contributions to engineering education(1999), Post-and-Telecommunication Minister's Award for contributions to computerization in education (2000), Minister's Award of Public



Management, Home Affairs, Posts and Telecommunications for contribution to computerization in education (2010), Achievement Award from Institute of Electronics, Information and Communication Engineers (2017), and Invention Encouragement Achievement Award from Japan Institute of Invention and Innovation (2017).

Ministry Council Member : He contributed in Ministry Council as member such as Science Council (1989-2000), Council on Lifelong Learning (1999-2001), Educational Personnel Training Council (2000), University Council (2000-2001), Central Education Council (2001-2002), University Establishment Council (2001-2008), Science and Technology Council(2002-2006), Council of Administrative Independent Institution and Assessment Committee(2003-2005), Central Education Council [Elementary and Secondary Education Section](2005-2009), Copyright Council (2002-2006), Telecommunications Technology Council(1990-1999), and so on.

2. Summary

He established the design method of wave absorbers and constructed many anechoic chambers for research of antenna and electronic noise. He also designed ferrite tile absorber to reduce the TV ghost for the surface of the Tokyo Metropolitan Government Building. He designed the rubber sheet type absorber, which was constructed for Bisan-Seto-Ohashi Bridge between Honshu and Shikoku.

He conducted research to theoretically calculate SAW characteristics when the piezoelectric material was cut arbitrarily. He discovered several new cuts for SAW devices such as LST-cut of quartz which is the most stable cut for the temperature change.

He has been very active in research on educational technology, such as distance education, evaluation of effectiveness by use of technology, sharing of learning objects, the curriculum development of information education for the future in Japan, and so on.

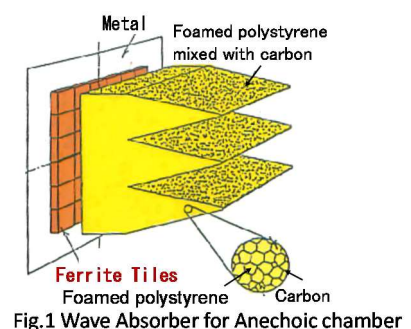
3. Summary of Designing Microwave Absorber

(1) Designing Microwave absorber and anechoic chambers

In order to design multi-layer microwave absorbers by a carbon-containing foam polystyrene, which Professor SUETAKE Kunihiro developed, SHIMIZU measured the frequency characteristics of ϵ_r' and ϵ_r'' with different carbon contents, and completed a computer program to solve the carbon content of each layer whose reflection coefficient of the wave absorber is less than the required specifications. He also designed the wave absorber that combines multi-layer dielectric materials and the ferrite tiles, which were used from 100MHz. These wave absorbers, which he designed, have been commercialized in more than 500 anechoic chambers.

(2) Ferrite tile absorber to reduce the TV ghost

TV ghost due to the reflection of TV waves by s high-rise buildings



became a social problem. He designed ferrite tile absorber and implemented to several buildings, but the surface of the Tokyo Metropolitan Government Building was granite. So, he designed absorber with 25 mm granite and 9.5 mm ferrite tiles to reduce the TV ghost. Then, in 1987, it was constructed on the wall surface of the upper part of the Tokyo Metropolitan Government Building.

(3) Rubber sheet type absorber to prevent radar false image

When the construction schedule for the Honshu-Shikoku Bridges was announced, there was opposition of radar false images. Then in 1978, "Radar Interference Countermeasures Review Committee" was established, and he examined it for 13 years. As results, he developed a rubber sheet type absorber with a thickness of 2.3 mm, which was a mixture of ferrite powder and carbon in rubber and was constructed for Bisan-Seto-Ohashi Bridges to prevent radar false images.

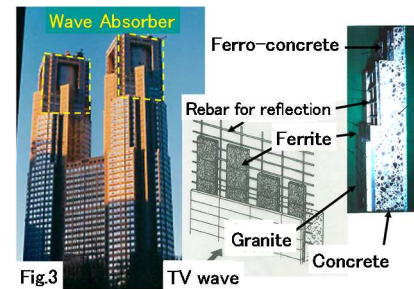


Fig.3



Fig.4 Bisan-Seto-Ohashi Bridge between Honshu and Shikoku

4. Summary of Temperature Stable SAW Substrate

(1) Theoretical research of propagation mode of SAW waveguide

From 1972 to 1973 he was a Post-Doctoral Fellow at Polytechnic Institute of Brooklyn where he began research on Surface Acoustic Waves. The research in Brooklyn was to theoretically calculate the characteristics of surface acoustic waveguides and to compare with experiment results.

(2) Surface wave propagation characteristics on a piezoelectric substrate cut at an arbitrary angle

After that, he conducted research to theoretically calculate the surface wave characteristics when the piezoelectric material was cut arbitrarily. Piezoelectric materials he targeted include quartz, LiNbO_3 , LiTaO_3 , $\text{Li}_2\text{B}_4\text{O}_7$, and $\text{La}_3\text{Ga}_5\text{SiO}_{14}$. He discovered "LST-cut" of rotated Y-cut of quartz when $\theta = 15.7^\circ$ for SAW devices, which is the most stable cut for the temperature change.

(3) Establishment of IEEE UFFC Tokyo Chapter

He served as Chairman of the Tokyo Chapter of IEEE UFFC (Ultrasonic, Ferroelectrics and Frequency Control) Society in 1993-1995.

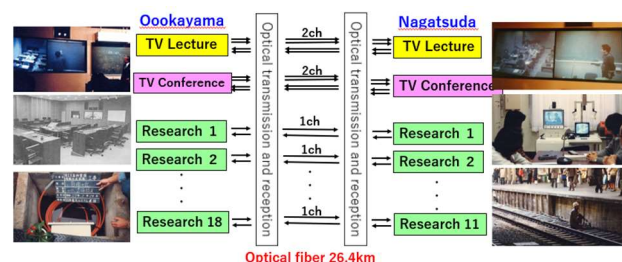
5. Summary of Research on Educational Technology

(1) Relationship between biological data and learning, Effectiveness of education using computer

He developed the system to measure the learner's pupil size and evaluated the interests during learning. The research on effectiveness of learning using computers and the Internet was also conducted for many situations.

(2) TV lecture system connected two campuses by optical fiber cables

He designed the TV lecture system connected the Ookayama campus and the Nagatsuda

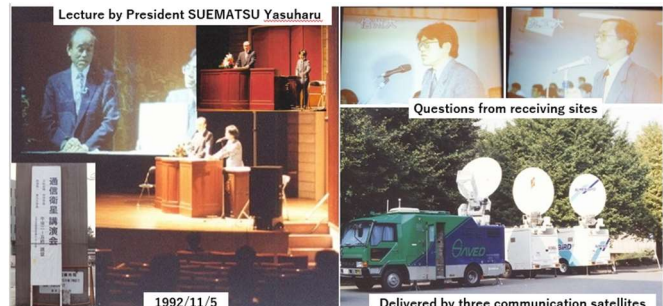


campus by 1.3 μm optical fiber cables in 1981. Two bi-directional TV channels were used to link lecture rooms on the two campuses. The image of the lecturer in one lecturer room was projected life-size on two large video screens in the second lecture room 26.4 kilometers away without repeater. He conducted the educational assessment of this TV lecture system and obtained interesting results.

(3) Trial experiments of distance education by communication satellite

As the chairman of the Ministry of Education's committee, he proposed education by satellite. Then, experiments of satellite education were conducted four times.

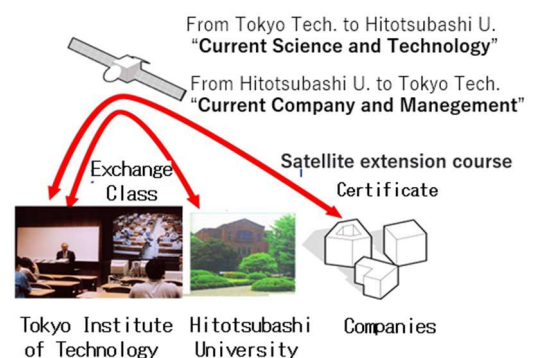
The first experiment was conducted in 1992, and Prof. SUEMATSU Yasuharu, President of Tokyo Institute of Technology, delivered a lecture to many receiving sites nationwide. The questionnaire was obtained from 4,051 participants, and satellite education was highly evaluated.



Educational lecture by an International Satellite were carried out with Harvard Business School in Cambridge, USA, where Prof. James I. Heskett conducted a debate class for students in Tokyo.

(4) Academic Network for Distance Education by Satellite (ANDES)

He established ANDES to exchange lectures between Tokyo Institute of Technology and Hitotsubashi University in 1996. Since it is important for professors to observe students during lecture, the professor can control a video camera to watch and communicate students by close-up image. Two subjects were taught between two universities: "Present enterprises and management" and "Present Science and Technology".



(5) National Information Center for Educational Resources (NICER)

In the "Virtual Agency" of the Obuchi Cabinet, he proposed the establishment of a new national center. Then, he launched NICER (LOM system) in 2002 as shown in Fig.8, and he systematically collected learning contents, which were provided by various institutions around the country on the web. Users could retrieve necessary contents categorized by National Course of Study.

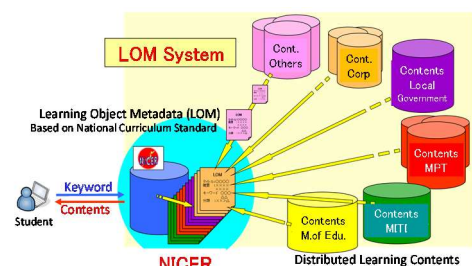


Fig.8 National Information Center for Educational Resources

(6) Gateway to Learning for Ability Development

When he worked at National Institute of Multimedia Education as President, he developed the Gateway to Learning for Ability Development (NIME-glad). The international "federated search" was completed in 2006, by partnership with EU, USA, Canada, Australia and Korea.

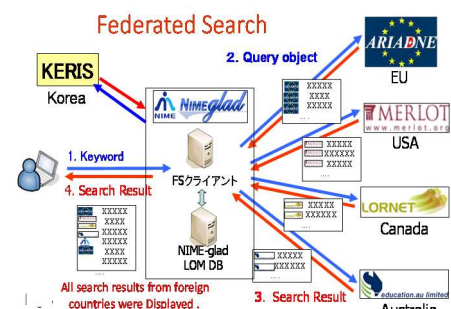


Fig.9 International Federated Search developed

6. Relationship with Government

He continually worked with Ministries on many topics but some activities are shown for examples.

(1) Promoting computerization of education

In 1996, Ministry of Education established "Conference of Research Collaborators on Promoting Computerization of Education in Elementary and Secondary Education", and he defined "ability to utilize information" as its Chairman for promoting information education. He strongly requested that the new compulsory subject "information" was established in the course of high school, in 1998.

(2) The revision of the University Establishment Standards for distance education

In order to promote distance education in universities, he was committed as Chairman of "Meeting to the revision of the University Establishment Standards." For example, distance education was positioned as one of the formal teaching methods in 1998.

(3) The revision of Copyright Law

In 2000, "Meeting of Research Collaborators on Educational Use of Copyrighted Works Utilizing Computers and Internet." was established, and he proposed amendments to the Copyright Law as Chairman. He was committed to revise Copyright Law for education in 2004 in Copyright Council.

(4) Effectiveness of Future School in a tablet PC environment for each student

As the chairman of the Future School Promotion Project (2010-2013) conducted by the Ministry of Internal Affairs and Communications in collaboration with MEXT, he supervised the practices of 20 demonstration schools nationwide and improvement of the academic ability of students.

(5) Contribution to Association of Engineering Education for Southeast Asia in UNESCO

When Japan took over the UNESCO AEESA headquarters secretariat (1985-1988), he published English journals and English newsletters and distributed them to member countries. At the AEESA General Assembly in 1983, 1985, 1988, and 1991, he was a keynote speaker as a representative.

(6) Establishment of "Educational Technology" in Grant-in-Aid for scientific research field

"Educational Technology" was recognized in 1993 as a research field of Grants-in-Aid for Scientific Research. He visited the Ministry of Education several times and submitted requests from 10 related academic societies. As a result, this triggered the development of educational technology.

7. References

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- [2] Yasutaka Shimizu and Masafumi Tanaka:" Leaky Surface Wave on Quartz and a New Cut with Extremely Small Temperature Coefficient", Jpn J. Appl. Phys, Vol.24, Sup.24-1, pp.139-141, 1985
- [3] SHIMIZU Yasutaka: "My Research History-from Electromagnetic Wave Research to Educational Technology", Institute of Electronics, Information and Communication Engineers (IEICE), Communication Society Magazine, No.28, spring, pp.329-334, 2014
- [4] SHIMIZU Yasutaka : "History of Educational Technology for 50years", Journal of IEICE, Vol.98, No.12, pp.1091-1097, 2015

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