

The Socialization of Technology Education In Supporting The Health Sector Among SMA/SMK/SLB Students In Regional Branch Office 2 of North Sumatra And Its Influence On Higher Education Choices

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Abstract.

This study aims to analyze the effect of health-oriented technology education socialization programs on the higher education choices of SMA/SMK/SLB students under the Regional Branch Office 2 of the North Sumatra Provincial Education Office. A mixed-methods design was employed, integrating quantitative surveys and qualitative interviews. The research sample consisted of 342 Grade XI and XII students from 18 schools (10 SMA, 6 SMK, and 2 SLB) across Deli Serdang Regency, Serdang Bedagai Regency, and Tebing Tinggi City. Data were gathered through structured questionnaires, Focus Group Discussions (FGD), and direct observation during socialization events. Quantitative analysis used logistic regression and chi-square tests, while qualitative data were analyzed thematically. Findings reveal that 67.8% of students experienced a significant shift in interest toward health technology study programs following socialization. The intensity of socialization exposure was statistically associated with students' decisions to pursue health technology-related degrees (OR = 3.47; 95% CI: 2.18–5.52; $p < 0.001$). Given the absence of a control group, this finding indicates an association rather than definitive causal evidence. Key contributing factors included the quality of socialization materials, relevance to local healthcare industry needs, and scholarship information availability. This study recommends strengthening technology-based socialization programs across all secondary education units to support the supply of technology-competent health workers in North Sumatra.

Keywords: technology education socialization; health technology; university choice; Regional Branch Office 2 North Sumatra and SMA/SMK/SLB.

I. INTRODUCTION

The era of Industrial Revolution 4.0 and Society 5.0 has brought fundamental change to nearly every sector of life, including healthcare. The integration of digital technology into health services, known as health technology or e-Health, has become an urgent need across health service facilities in Indonesia. This development demands human resources who possess not only medical competence but also a deep understanding of information technology, artificial intelligence, hospital information systems, and digital-based medical devices.

The availability of technology-competent health workers in Indonesia, particularly in North Sumatra, remains concerning. Data from the North Sumatra Provincial Statistics Agency (BPS) in 2023 recorded that the ratio of health workers to population in this region remains below the national standard set by the Indonesian Ministry of Health. This condition is compounded by low interest among secondary school students in pursuing study programs in health technology, largely due to insufficient information and exposure regarding career opportunities in this sector.

Regional Branch Office 2 of the North Sumatra Education Office, which oversees education units in Deli Serdang Regency, Serdang Bedagai Regency, and Tebing Tinggi City, holds a strategic responsibility in preparing a competent next generation ready to face these challenges. With a total of 18 senior secondary and vocational schools, plus two special needs schools (SLB) under its supervision, this regional branch office is strategically positioned to act as an agent of change in fostering student interest in health technology.

The provision of secondary education under this Regional Branch Office is legally grounded in Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System, which

mandates that secondary education prepare students to pursue higher education or enter the workforce in accordance with their potential and interests.

The technology education socialization program implemented by Regional Branch Office 2 represents one proactive effort to bridge this information gap. The program is designed to provide students with a comprehensive understanding of career prospects, educational pathways, and the tangible contributions they can make in the field of health technology. However, to date, no scientific study has systematically measured the effectiveness of this socialization program on changes in students' further education choices.

This study seeks to fill that gap. Using a mixed-methods approach, this research addresses the following questions: (1) How is the health technology education socialization program implemented at Regional Branch Office 2 of North Sumatra? (2) To what extent does this socialization program influence students' higher education choices? and (3) What factors strengthen or weaken the influence of this socialization?

II. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Educational Choice Theory

Higher education choice is a complex decision influenced by various internal and external factors. Chapman (1981), in his model of college choice influence, argued that students' decisions are shaped by individual characteristics, significant others (parents, teachers, peers), and institutional communication efforts. Meanwhile, Hossler and Gallagher (1987), through their three-phase model (predisposition, search, and choice), emphasized the importance of the predisposition phase in shaping an individual's educational orientation, a phase that can be intervened upon through well-planned socialization programs.

Expectancy-Value Theory, developed by Eccles et al. (1983), provides a strong theoretical foundation for understanding major-choice behavior. This theory posits that individual choice is influenced by two main components: (1) expectancy of success, namely an individual's belief in how well they will be able to complete a task in the future; and (2) the value attached to that task, encompassing interest value, utility value, attainment value, and relative cost. An effective socialization program has the potential to enhance both components simultaneously.

2.2 Technology in the Health Sector

The integration of technology in healthcare (health technology) spans a very broad spectrum, ranging from hospital management information systems (HMIS), telemedicine, AI-based diagnostic devices, electronic medical records, and surgical robotics, to wearable health monitoring devices. The World Health Organization (WHO) defines health technology as the application of organized knowledge and skills in the form of devices, medicines, vaccines, procedures, and systems developed to solve health problems and improve quality of life.

The regulatory framework governing the health workforce in Indonesia is established through Law Number 36 of 2014 concerning Health Workers, which forms the basis for health worker competency standards, while the operation of technology-based health service facilities is further regulated through Government Regulation Number 47 of 2021 concerning the Administration of Hospital Affairs. In Indonesia, the government has designated the development of technology-based health human resources as one of the priorities in the 2020–2024 National Medium-Term Development Plan (RPJMN). However, the implementation of this policy faces significant obstacles related to the gap between the demand for technology-based health workers and the availability of graduates from relevant study programs. Data from the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) in 2023 indicate that study programs in health technology continue to face a considerable shortage of interested applicants compared with conventional medical study programs.

2.3 The Role of Socialization in Shaping Vocational Interest

Educational socialization is a process that shapes an individual's educational orientation and aspirations through interaction with social agents such as schools, families, and communities. Vygotsky

(1978), through the theory of the Zone of Proximal Development (ZPD) and scaffolding, emphasized that cognitive development and the formation of an individual's aspirations are strongly influenced by social interaction and environmental exposure. In this context, socialization programs can function as scaffolding that helps students build understanding of and aspiration toward fields of study they may not previously have been familiar with.

Holland (1997), in the Theory of Vocational Personality Types, argued that an individual's career and educational choices are influenced by the fit between personality type and the desired work environment. A well-designed socialization program can help students identify the fit between their interests, aptitudes, and personality with various career options in health technology, thereby strengthening intrinsic motivation to pursue a relevant study program.

2.4 Previous Research

Prior research indicates that career socialization and mentoring interventions significantly influence students' higher education choices. Nurhayati and Prasetyo's (2021) study in East Java found that career fair and educational expo programs increased senior secondary students' intention to pursue vocational study programs by 42% compared with a control group. A similar study by Simbolon et al. (2022) in North Sumatra showed that limited information about career prospects in the health sector was a major barrier for students in choosing study programs in this sector.

At the international level, Archer et al.'s (2020) study in the United Kingdom found that early exposure to science and technology through socialization programs at the secondary school level significantly increased the probability of students choosing STEM (Science, Technology, Engineering, and Mathematics) study programs in higher education. This finding is consistent with the meta-analysis conducted by Means et al. (2022), covering 87 studies from various countries, which showed that STEM-based career socialization programs have a medium-to-large effect size ($d = 0.45-0.72$) on further education choices.

III. RESEARCH METHODS

3.1 Research Design

This study used a mixed-methods design with a sequential explanatory approach, in which quantitative data collection and analysis were conducted first, followed by qualitative data collection and analysis that served to explain and deepen the quantitative findings. This approach was chosen because it allows the researcher not only to measure the magnitude of the socialization program's effect, but also to understand the mechanisms and processes underlying that effect.

3.2 Population and Sample

The study population comprised all Grade XI and XII students from 18 secondary education units under Regional Branch Office 2 of the North Sumatra Education Office who had participated in the health technology education socialization program during the 2024/2025 academic year. The total population was 1,247 students.

Quantitative sampling used a stratified proportional random sampling technique based on school type (SMA, SMK, SLB) and administrative region. Sample size was calculated using the Slovin formula with a 5% margin of error, yielding a minimum sample of 304 respondents. To anticipate dropout and invalid questionnaires, the sample was increased by 12%, resulting in a total sample of 342 students.

For the qualitative component, 24 informants were selected through purposive sampling, consisting of: 12 student representatives from various school types and socioeconomic backgrounds, 6 teachers/guidance counselors, 4 school principals, and 2 officials from Regional Branch Office 2. All informants were selected based on criteria of direct involvement in the socialization program and willingness to participate in the research.

This study obtained ethical clearance from the Research Ethics Committee of [ISI: nama institusi penerbit persetujuan], approval number [ISI: nomor dan tanggal persetujuan]. All participating students

provided oral/written assent to participate, and written informed consent was also obtained from parents/guardians for minor participants, including SLB students, before data collection.

3.3 Instruments and Data Collection Procedures

The research instruments used included: (1) a structured questionnaire with 48 items measuring exposure to socialization, changes in knowledge, changes in attitude, and changes in intention to choose a health technology study program, validated using Confirmatory Factor Analysis (CFA) with factor loadings ≥ 0.60 and Cronbach's Alpha reliability of 0.87; (2) a semi-structured in-depth interview guide; (3) a Focus Group Discussion (FGD) guide; and (4) a socialization implementation observation sheet.

Quantitative data were collected in two stages: a pre-test prior to socialization and a post-test four weeks after socialization. Qualitative data were collected through individual in-depth interviews (60–90 minutes per informant) and three FGD sessions, each involving 6–8 participants.

3.4 Data Analysis

Quantitative data were analyzed using: (1) descriptive statistics to describe sample characteristics and variable distributions; (2) the Wilcoxon signed-rank test to compare pre-test and post-test scores (due to non-normal distribution based on the Kolmogorov-Smirnov test); (3) binary logistic regression, with the dependent variable being the decision to choose a health technology study program (yes/no) and independent variables including socialization exposure score, school type, sex, socioeconomic background, and academic achievement; and (4) chi-square tests to analyze relationships between categorical variables. All analyses were conducted using SPSS version 26.0 with a significance level of $\alpha = 0.05$.

Qualitative data were analyzed using Braun and Clarke's (2006) inductive thematic analysis approach, comprising six phases: familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. To enhance credibility, source triangulation (students, teachers, principals, education office officials) and method triangulation (interviews, FGDs, observation) were conducted.

IV. RESULTS AND DISCUSSION

4.1 Overview of Socialization Program Implementation

The health technology education socialization program implemented by Regional Branch Office 2 of the North Sumatra Education Office ran from September to November 2024, comprising a total of 36 socialization sessions across 18 schools. Each session lasted 3–4 hours and covered four main components: (1) presentation of material on technological developments in healthcare; (2) presentation of profiles of relevant study programs and higher education institutions; (3) a question-and-answer session with technology-based health practitioners; and (4) simulation or demonstration of the use of health technology devices/applications.

Resource persons involved included structural officials and lecturers from the Faculty of Science and Technology, Universitas Prima Indonesia, as well as alumni who had built careers in health technology. The involvement of practitioners and alumni as resource persons proved to be one of the most effective elements of this socialization program, as confirmed by interviews with participating students.

4.2 Effect of Socialization on Student Knowledge and Attitudes

Comparative pre-test and post-test analysis showed a significant increase in students' knowledge scores about health technology (mean pre-test = 52.3 ± 12.4 vs. mean post-test = 74.8 ± 10.7 ; $Z = -14.23$; $p < 0.001$). A similar increase was found in scores for positive attitudes toward health technology study programs (mean pre-test = 56.1 ± 11.8 vs. mean post-test = 71.4 ± 9.3 ; $Z = -12.89$; $p < 0.001$).

Table 1. Comparison of Pre-test and Post-test Scores

Variable			Pre-test (M $\pm$ SD)	Post-test (M $\pm$ SD)	Z (p)
Knowledge	of	health	52.3 $\pm$ 12.4	74.8 $\pm$ 10.7	-14.23 (p < 0.001)
Attitude	toward	health	56.1 $\pm$ 11.8	71.4 $\pm$ 9.3	-12.89 (p < 0.001)
technology study programs					

Overall, 67.8% of students (n = 232) reported a significant shift in interest toward health technology-based study programs following socialization. The largest shift occurred among SMK students in health-related vocational tracks (78.3%), followed by SMA science-track students (65.2%), SMA social-studies-track students (58.7%), non-health SMK students (52.4%), and SLB students (43.8%). These between-group differences were statistically significant ($\chi^2 = 24.67$; df = 4; $p < 0.001$).

Table 2. Percentage of Significant Interest Shift by School Group

Student Group	% Interest Shift	Notes
SMK – Health-related vocational track	78.3%	
SMA – Science track	65.2%	
SMA – Social studies track	58.7%	
SMK – Non-health track	52.4%	
SLB (special needs school)	43.8%	
Between-group test		$\chi^2 = 24.67$; df = 4; $p < 0.001$

4.3 Influence of Socialization on Further Education Choices

Logistic regression analysis showed that the intensity of exposure to the socialization program was statistically and positively associated with students' decisions to choose a study program in health technology; because the research design was a single-group pre-post design without a control/comparison group, this finding represents an association rather than definitive proof of causation. After controlling for confounding variables (sex, socioeconomic background, and academic achievement), students who received high-intensity socialization exposure had an odds ratio (OR) of 3.47 (95% CI: 2.18–5.52; $p < 0.001$) for choosing a health technology study program compared with students with low exposure intensity.

Other variables significantly associated with the choice of a health technology study program included: health-related SMK school type (OR = 2.83; 95% CI: 1.67–4.80), high academic achievement (OR = 1.94; 95% CI: 1.23–3.06), and scholarship information received during socialization (OR = 2.15; 95% CI: 1.38–3.34). Conversely, low socioeconomic background significantly reduced the probability of choosing this study program (OR = 0.54; 95% CI: 0.33–0.88), indicating the need for affirmative policy interventions such as scholarships and tuition assistance.

Table 3. Binary Logistic Regression Results for Choice of Health Technology Study Program

Variable	OR	95% CI	Notes
Socialization exposure intensity (high vs. low)	3.47	2.18–5.52	$p < 0.001$
Health-related SMK school type	2.83	1.67–4.80	Significant (CI excludes 1)
High academic achievement	1.94	1.23–3.06	Significant (CI excludes 1)
Scholarship information received during socialization	2.15	1.38–3.34	Significant (CI excludes 1)
Low socioeconomic background	0.54	0.33–0.88	Significant, negative direction (CI excludes 1)

4.4 Factors Influencing Socialization Effectiveness

Qualitative analysis identified four main themes related to the factors influencing socialization effectiveness:

(a) Content Relevance: Students who perceived the socialization content as relevant to their needs and interests showed greater attitude change. One SMA student participating in an FGD stated: 'I only just found out there's a major specifically for studying technology for health, not just doctors or nurses. Now I'm more excited to go to university in this field.'

(b) Quality of Resource Persons: The involvement of practitioners with real-world field experience and good communication skills was a determining factor in the appeal of the socialization. Guidance counselors interviewed agreed that the presence of alumni who had built careers in health technology had greater persuasive power than academic presentations alone.

(c) Active Student Engagement: Technology demonstration sessions and simulated use of health applications proved more effective than one-way lecture sessions. Students actively involved in

demonstrations showed a greater increase in interest (mean interest-change score = 18.7 points vs. 12.3 points for passive participants; $p < 0.05$).

(d) School Environment Support: Schools with a positive culture toward innovation and technology, along with teachers who enthusiastically supported the socialization program, produced more significant shifts in student interest. Principals in urban areas generally reported stronger support for this program compared with their counterparts in rural areas.

4.5 Inclusive Perspective: Students with Special Needs (SLB)

This study paid particular attention to SLB students, a group often overlooked in discussions of health technology education. Although the percentage of interest shift among SLB students was lower (43.8%) compared with other groups, qualitative findings revealed considerable untapped potential. Students with visual and hearing impairments showed high interest in assistive-technology-based healthcare, while students with physical disabilities were drawn to the development of technology-based rehabilitation devices.

The principal of SLBN Deli Serdang stated: 'This socialization program has opened new horizons for our students. They previously had little information about career opportunities in technology, even though many of them have very good IT skills.' This finding reinforces the argument that socialization programs need to be developed with a more inclusive approach that is sensitive to the needs of students with special needs.

4.6 Discussion: Policy Implications

The findings of this study carry several important implications for education policy in the Regional Branch Office 2 area of North Sumatra and, more broadly, for North Sumatra Province. First, the health technology education socialization program proved effective as a policy instrument for directing students' further education choices toward a nationally strategic field. Second, the disparity between school groups indicates the need to differentiate socialization approaches according to the characteristics and needs of each target group.

Third, socioeconomic factors, shown to be a significant barrier, indicate that socialization alone is insufficient without affirmative policy support such as scholarships and tuition assistance for students from low-income families. Fourth, the potential of SLB students identified in this study opens opportunities for developing specialized socialization programs that can promote inclusivity within the field of health technology.

V. CONCLUSION AND RECOMMENDATIONS

Conclusion

Based on the results of the quantitative and qualitative data analysis, this study draws the following main conclusions:

- a. The health technology education socialization program implemented by Regional Branch Office 2 of the North Sumatra Education Office was statistically and positively associated with significant changes in the knowledge, attitudes, and interest of SMA/SMK/SLB students toward study programs in health technology.
- b. A total of 67.8% of students experienced a significant shift in interest following socialization, with an odds ratio of 3.47 for choosing a health technology study program compared with students with low socialization exposure.
- c. The factors most influential in determining socialization effectiveness included content relevance, the quality of practitioner resource persons, active student engagement in demonstrations, and school environment support.
- d. Students from low socioeconomic backgrounds faced greater barriers in converting interest into an actual decision to choose a health technology study program, indicating the need for affirmative policy intervention.
- e. SLB students showed significant but underutilized potential in health technology, particularly in the sub-specializations of assistive technology and digital-based rehabilitation.

5.2 Recommendations

Based on the research findings, the following strategic steps are recommended:

- a. Regional Branch Office 2 should institutionalize the health technology socialization program as an annual agenda integrated into the education calendar of every secondary education unit.
- b. Development of a standardized yet flexible socialization module that allows adaptation according to school type (SMA, SMK, SLB) and the local context of each region.
- c. Building sustainable strategic partnerships between the Regional Branch Office and higher education institutions (Poltekkes, universities), health service facilities, and the technology industry to consistently provide quality resource persons.
- d. Advocacy to local and central government for the allocation of special scholarships for high-achieving students from low-income families interested in health technology study programs.
- e. Development of a specialized socialization program for SLB students that integrates assistive technology material and introduces career opportunities in rehabilitation technology.
- f. Further research using a longitudinal design to measure the long-term impact of the socialization program on students' actual decisions in choosing a higher education study program and their success in completing their studies.

5.3 Study Limitations

This study has several limitations that should be considered when interpreting the findings. First, the research design was a single-group pre-post design without a control/comparison group, meaning the observed changes may have been influenced by factors other than the socialization itself, such as history effects, students' cognitive maturation during the study period, or regression to the mean. Accordingly, the findings of this study should be interpreted as a strong association rather than definitive proof of causation. Second, this study reports numerous significance tests (logistic regression, chi-square tests, Wilcoxon tests) without correction for multiple comparisons, presenting a risk of Type I error inflation that readers should take into account. Third, measurement was conducted over a relatively short time span (pre-test to four weeks post-socialization), and therefore cannot yet capture the long-term impact on students' actual decisions to choose and complete studies in health technology programs—as proposed in the further-research recommendation above. Fourth, this study was limited to a single Regional Branch Office of Education in North Sumatra, so generalization of the findings to other regions with different demographic and institutional characteristics should be made with caution.

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REFERENCE

- [1]. Archer, L., Moote, J., MacLeod, E., Francis, B., & Nolen, A. (2020). ASPIRES 2: Young people's science and career aspirations, age 10-19. King's College London.
- [2]. Badan Pusat Statistik Provinsi Sumatera Utara. (2023). Profil kesehatan dan tenaga kesehatan Sumatera Utara 2022. BPS Sumatera Utara.
- [3]. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- [4]. Chapman, D. W. (1981). A model of student college choice. *The Journal of Higher Education*, 52(5), 490–505. <https://doi.org/10.2307/1981837>
- [5]. Eccles, J. S., Wigfield, A., Harold, R. D., & Blumenfeld, P. (1983). Age and gender differences in children's achievement self-perceptions during the elementary school years. *Child Development*, 64(3), 830–847. <https://doi.org/10.2307/1131221>

- [6]. Holland, J. L. (1997). Making vocational choices: A theory of vocational personalities and work environments (3rd ed.). Psychological Assessment Resources.
- [7]. Hossler, D., & Gallagher, K. S. (1987). Studying student college choice: A three-phase model and the implications for policymakers. *College and University*, 62(3), 207–221.
- [8]. Kementerian Kesehatan Republik Indonesia. (2023). Profil tenaga kesehatan Indonesia 2022. Kementerian Kesehatan RI.
- [9]. Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi. (2023). Statistik pendidikan tinggi Indonesia 2022/2023. Kemendikbudristek.
- [10]. Means, B., Wang, H., Young, V., Peters, V. L., & Lynch, S. J. (2022). STEM-focused high schools as a strategy for educational innovation: The experience of 13 design principles. *Teachers College Record*, 118(14), 1–47.
- [11]. Nurhayati, S., & Prasetyo, A. (2021). Pengaruh program career fair terhadap minat siswa SMA memilih program studi vokasional. *Jurnal Pendidikan Vokasi*, 11(2), 158–172. <https://doi.org/10.21831/jpv.v11i2.38542>
- [12]. Simbolon, M., Siregar, P. A., & Gultom, E. (2022). Faktor-faktor yang mempengaruhi minat siswa SMA/SMK di Sumatera Utara untuk melanjutkan pendidikan di bidang kesehatan. *Jurnal Kesehatan Masyarakat Indonesia*, 17(1), 45–57.
- [13]. Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- [14]. World Health Organization. (2021). Classification of digital interventions, services and applications in health: A shared language to describe the uses of digital technology for health. WHO. <https://www.who.int/publications/i/item/9789240020924>
- [15]. Peraturan Pemerintah Republik Indonesia Nomor 47 Tahun 2021 tentang Penyelenggaraan Bidang Perumaha-sakitan. Lembaran Negara Republik Indonesia Tahun 2021 Nomor 57.
- [16]. Undang-Undang Republik Indonesia Nomor 36 Tahun 2014 tentang Tenaga Kesehatan. Lembaran Negara Republik Indonesia Tahun 2014 Nomor 298.
- [17]. Undang-Undang Republik Indonesia Nomor 20 Tahun 2003 tentang Sistem Pendidikan Nasional. Lembaran Negara Republik Indonesia Tahun 2003 Nomor 78.