

Analysis of Strengthening Educational and Research Capacity: A Case Study of Health Higher Education Institution in Deli Serdang

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Abstract.. Global health systems face multifaceted threats in 2025, including widening equity gaps and the rapid expansion of digital health technologies. This study analyses how a Health Higher Education Institution (HHEI) in Deli Serdang strengthens its education and research capacity to respond to these challenges. A qualitative case study was conducted through document review, interviews with faculty and students, and observation of research support systems. Findings show that capacity building focuses on curriculum internationalisation, collaborative research, and digital competency development. However, constraints remain, such as limited AMR research funding, inadequate digital infrastructure, and uneven research skills. Visionary leadership and cross sector collaboration are essential to integrate global health perspectives into teaching and research.

Keywords: Educational, Research Capacity, Global Health, Higher Education.

1 Introduction

The landscape of global health is becoming increasingly complex. In 2025, antimicrobial resistance (AMR) has been identified as one of the greatest threats to public health, with the World Health Organization (WHO) estimating that 700,000 deaths per year are currently attributable to AMR, and this number could rise to 10 million annually by 2050 if no action is taken [1], [9]. Indonesia, as a lower middle income country, has been reported to have one of the highest projected increases in antimicrobial consumption in Southeast Asia by 2030 [2]. Meanwhile, the expansion of digital health technologies in Indonesia is transforming health education and service delivery [5]. The Ministry of Health (MoH) launched the SatuSehat digital platform in 2024, integrating electronic medical records from more than 15,000 healthcare facilities nationwide [4]. Health tech startups have attracted over US \$870 million in investment in 2024, with telemedicine platforms serving over 23 million monthly users [3]. For HHEI, such as the one located in Deli Serdang Regency, these changes demand new educational models that combine transformative learning, digital competency, and global research collaboration [6]. Despite these developments, many HHEI in Indonesia still face challenges in aligning curricula, research priorities, and institutional capacity with global health agendas [9,4]. This study seeks

to analyse how a regional HHEI in Deli Serdang strengthens its educational and research capacity to address these emerging challenges. The study aims to (1) identify key educational and research strengthening strategies; (2) explore institutional barriers; and (3) propose a framework to guide capacity development toward future readiness [10].

1.1 Factual Model in the Field

Field findings show that the HHEI in Deli Serdang operates within a transitional capacity building model with partial alignment to global health education standards. AMR awareness and digital health literacy have been introduced, but only 58% of study programs integrate these competencies into curricula [11]. Although faculty development exists, 64% of lecturers have only basic digital skills and 22% are ready for advanced pedagogy. The Global Health Research and Innovation Unit supports research [8], yet effectiveness is limited by low lab utilization (45%), minimal internal funding (14%), small scale studies (72%), methodological gaps (48%), and inadequate digital infrastructure affecting 60% of researchers..

1.2. Importance Preliminary Data: Questionnaire Based Study

Preliminary data from questionnaires administered to 50 faculty members and 80 students show several key capacity gaps within the institution. Among faculty, 56% reported that global health topics such as AMR and digital health are only partially integrated into the curriculum, while 59% indicated having only basic digital teaching skills. In the research domain, 48% stated a need for further methodological training, and 41% experienced difficulties accessing digital research databases. Among students, 62% reported limited exposure to global health case studies, and although 67% expressed strong interest in global health related research, only 29% felt that sufficient opportunities are available [14].

Table 1. Distribution and Frequency of Preliminary Questionnaire Responses

No	Indicator Assessed	Yes (%)	No (%)
1	Global health topics (AMR, digital health) are sufficiently integrated into the curriculum	44%	56%
2	Faculty have adequate digital teaching competency	41%	59%
3	Faculty feel confident in research methodology skills	52%	48%
4	Faculty have adequate access to digital research databases	59%	41%
5	Students receive adequate exposure to global health case studies	38%	62%
6	Students have sufficient opportunities to join global health related research	29%	71%
7	Students are interested in participating in global health related research	67%	33%

1.3 Purpose of the Study

The purpose of this study is to analyse how a HHEI in Deli Serdang strengthens its educational and research capacity in response to emerging global health challenges. It focuses on strategies related to curriculum internationalisation, collaborative research development, and digital

competency enhancement, while identifying key institutional barriers such as funding limitations, digital infrastructure gaps, and disparities in faculty research skills. The study aims to generate a conceptual framework to support future ready capacity building in health education institutions.

2 Method

2.1 Research Design

This study is guided by Transformative Learning Theory as the grand theory, emphasizing critical reflection and adaptation to global contexts. Capacity Building Theory serves as the middle theory, focusing on institutional strengthening through curriculum enhancement, research collaboration, and digital competency development [7]. Institutional Readiness Models function as the operational theory, using indicators such as curriculum alignment, research productivity, and digital infrastructure to assess preparedness for global health challenges.

2.2 Types of Mixed Methods Processes

This study uses a qualitatively driven mixed methods approach in which qualitative data are primary and quantitative data provide support. Interviews, document review, and observations offer in-depth insights into institutional capacity building practices. Preliminary questionnaire results supply measurable indicators on curriculum integration, digital competency, and research readiness, with both datasets merged in a convergent design to strengthen interpretive validity.

2.3 Data Collection Techniques

Definition and Conceptual Foundation

Educational and research capacity is defined as the institution's ability to align its curriculum, research productivity, and digital competence with emerging global health challenges. The variables examined include capacity building strategies curriculum internationalisation, research collaboration, and digital competency development as independent variables, and institutional readiness for global health challenges as the dependent variable (document analysis, the extent of research partnership activities, and faculty digital competency levels) . The dependent variable is assessed using indicators of curriculum alignment, research productivity, and the adequacy of digital infrastructure. Intervening variables, such as funding availability, digital infrastructure quality, and faculty research skills (interviews, observations, and questionnaire results) [16].

Types of Data Collection Applied in This Study

This study uses multiple data collection methods to understand the institution's educational and research capacity. Document reviews analyse curricula, policies, and research guidelines related to global health responsiveness. Semi structured interviews with faculty, students, and administrators explore curriculum integration, research practices, digital competencies, and institutional barriers. Observations of teaching, digital facilities, and research support systems provide contextual insights. Questionnaires offer quantitative data on digital skills, curriculum

exposure, and research readiness, enabling triangulation and strengthening the study's validity and reliability.

Table 2. Activities Conducted in This Study

Activity	Research Method Used	Application in This Study
Curriculum and policy review	Document Review	Analysing curriculum internationalisation, digital health integration, and research policies.
Stakeholder interviews	Semi Structured Interviews	Exploring faculty and student perceptions of AMR education, digital competency, and research barriers.
Institutional facility observation	Observation	Examining laboratory utilisation, digital infrastructure, and research data access systems.
Capacity assessment survey	Survey	Measuring digital skills, curriculum exposure, and research readiness among faculty and students.
Triangulation of datasets	Mixed Methods	Validating findings by cross checking qualitative insights with quantitative indicators.

2.4 Data Analysis

Definition and Theoretical Basis

Data analysis in this study is defined as the systematic process of organising and interpreting qualitative and quantitative data to assess the institution's educational and research capacity. Qualitative data from interviews, observations, and documents are analysed through thematic content analysis to identify patterns in curriculum internationalisation, digital competency, and research collaboration. Quantitative questionnaire data are summarised using descriptive statistics to reinforce qualitative findings. A convergent mixed methods approach is applied, allowing both datasets to be compared and integrated for stronger analytical validity. The analysis is guided by Transformative Learning and Capacity building theories, which frame the evaluation of institutional readiness for global health challenges.

Data Analysis Procedures

Data analysis was conducted through a mixed methods sequence involving several key steps. First, qualitative data from interviews, observations, and document reviews were coded and organised into thematic categories. Second, quantitative questionnaire data were analysed using descriptive statistics to generate supportive numerical indicators. Third, qualitative and quantitative findings were merged through a convergent comparison process to identify reinforcing and contrasting patterns. Fourth, all results were interpreted using Transformative Learning Theory and Capacity building Theory to assess institutional readiness. Integrated findings were synthesised to develop conclusions and a capacity building framework.

Table 3. Summary of Analytical Flow

Process Stage	Key Activities	Output Generated
Data Collection	Document review semi structure interviews Observations Questionnaire survey	Raw qualitative and quantitative data
Data Organisation & Coding	Transcribing interviews Categorising documents Coding themes Entering survey responses	Organised datasets; initial codes
Qualitative Data Analysis	Thematic analysis Identifying patterns in curriculum, digital competency, and research capacity	Thematic categories and narrative patterns
Quantitative Data Analysis	Descriptive statistics Frequency tables Numerical indicators	Statistical summaries supporting themes
Mixed Methods Integration	Merging qualitative and quantitative findings Convergent comparison Triangulation	Consolidated interpretation across datasets
Theory Guided Interpretation	Applying Transformative Learning Theory Applying Capacity building Theory Assessing institutional readiness	Theory based explanation of findings
Final Conclusions & Framework	Identifying institutional gaps Formulating strengthening strategies Developing conceptual framework	Final conclusions and practical model for capacity development

3. Results and Discussion

3.1 Preliminary Analysis

Preliminary analysis of the data reveals several foundational insights into the educational and Research capacity of the HHEI in Deli Serdang shows partial integration of global health elements, including AMR awareness, digital health literacy, and internationalised curriculum components. Questionnaire results indicate that 56% of faculty and 62% of students perceive global health content as only partly embedded. Interviews and surveys reveal faculty reliance on basic digital tools and limited readiness for technology-enhanced teaching. Observations also identify underutilised laboratories and restricted database access as barriers to research productivity, while high student interest contrasts with limited research opportunities

3.2 Integrated Discussion

The findings of this study indicate that the educational and research capacity of the HHEI in Deli Serdang is in a transitional stage, characterized by partial integration of global health competencies, uneven digital readiness, and constrained research productivity. However, these findings should not be viewed merely as descriptive outcomes but must be interpreted within broader theoretical and empirical contexts. From the perspective of Transformative Learning Theory, the partial integration of global health content (reported by 56% of faculty and 62% of students) suggests that the institution has not yet fully achieved critical reflection and paradigm transformation in its curriculum. According to Mezirow's framework, transformative learning

requires not only exposure to new content but also deep structural changes in teaching approaches and institutional mindset. The current condition reflects a surface level adaptation, rather than a transformative shift toward global health oriented education. These findings are consistent with previous studies indicating that many health education institutions in developing countries struggle to integrate global health perspectives systematically into curricula [13]. Similar patterns have been observed where curriculum internationalisation remains fragmented and dependent on individual faculty initiatives rather than institutional policy alignment. In terms of digital competency, the finding that 59% of faculty possess only basic digital teaching skills highlights a significant gap in institutional readiness. This aligns with global evidence suggesting that digital transformation in higher education often faces resistance due to limited faculty capacity and insufficient training systems. The lack of advanced digital pedagogy not only affects teaching quality but also limits the institution’s ability to engage in digital research collaboration and data driven innovation.

Table 4. Mixed Methods Analysis Summary

Aspect Examined	Quantitative	(Mixed Methods)
Curriculum Integration (AMR & Digital Health)	56% of faculty and 62% of students report partial integration.	Both datasets confirm inconsistent curriculum alignment with global health standards.
Faculty Digital Competency	59% of faculty report only basic digital teaching skills.	Strong convergence showing a clear digital competency gap.
Research Infrastructure & Productivity	41% faculty report difficulty accessing digital research databases.	Digital and infrastructural constraints significantly reduce research capacity.
Student Exposure and Research Opportunities	67% interested vs. only 29% having opportunities.	Clear mismatch between student interest and institutional support for global health research.
Institutional Readiness	Descriptive indicators show variations in competency and access.	Readiness is emerging but limited by structural, resource, and skill related barriers.

Furthermore, the mismatch between student interest (67%) and research opportunities (29%) highlights a structural inefficiency in talent utilisation. This phenomenon has also been reported in global higher education contexts, where student engagement in research is often constrained by institutional capacity rather than motivation [12]. Without structured research pathways, such as research assistantships or project based learning, student potential remains underutilised. Importantly, the findings also reveal that institutional readiness is not solely a technical issue but a leadership and governance issue [15]. Visionary leadership plays a critical role in driving curriculum reform, fostering research culture, and mobilising external collaborations. Studies in global health education emphasize that cross-sector collaboration and strategic leadership are key determinants of successful institutional transformation.

4. Conclusion

This study concludes that the HHEI in Deli Serdang has initiated important capacity building efforts through curriculum internationalisation, collaborative research development, and digital competency enhancement. However, these efforts remain unevenly implemented, as shown by the partial integration of global health content and significant gaps in faculty digital readiness. Research capacity is further constrained by limited funding, underdeveloped infrastructure, and inadequate access to integrated research databases, resulting in low research productivity and restricted student involvement. Mixed methods findings consistently indicate that high student interest in global health issues is not matched by sufficient institutional opportunities or support systems. Overall, the institution demonstrates emerging readiness to address global health challenges but requires stronger leadership, better resource allocation, and cross sector collaboration to become fully future ready.

4.1 Recommendations

The recommendations in this research are: (1) strengthen the integration of global health content particularly AMR, digital health, and international perspectives across all study programs through systematic curriculum revision and faculty training; enhance faculty digital competency by implementing structured training, certification programs, and continuous mentoring to support technology enabled teaching and research; (2) improve research infrastructure by upgrading laboratory capacity, expanding digital connectivity, and establishing integrated research data systems to increase research productivity; (3) expand research funding mechanisms, both internally and through external partnerships, with priority given to AMR and other global health related studies; (4) increase opportunities for student participation in global health research through research assistantships, project incubators, and international collaborations to optimise their existing high interest; and (5) strengthen institutional leadership and cross sector collaboration to accelerate educational and research capacity development toward global health readiness.

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