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DIGITAL TRACER STUDY TRANSFORMATION FOR TEACHER EMPOWERMENT AND ALUMNI EMPLOYABILITY AT SMK KARTIKA XX-1 MAKASSAR

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Abstrak

Transformasi digital dalam pendidikan vokasi tidak hanya menuntut ketersediaan sistem teknologi, tetapi juga pemberdayaan guru sebagai aktor kunci dalam tata kelola institusional. Salah satu instrumen yang memiliki peran strategis dalam proses ini adalah tracer study, yang dalam praktiknya masih sering dilaksanakan secara manual dan terfragmentasi di sekolah kejuruan. Kegiatan pengabdian masyarakat bertujuan memperkuat literasi digital dan kapasitas analitis guru melalui implementasi sistem tracer study digital di SMK Kartika XX-1 Makassar. Program dilaksanakan melalui 5 tahapan, yaitu sosialisasi, pelatihan peningkatan kapasitas, implementasi sistem, pendampingan, dan perencanaan keberlanjutan. Sebanyak 22 guru dan operator jurusan terlibat sebagai peserta kegiatan. Pengumpulan data dilakukan melalui instrumen pre-test dan post-test serta kuesioner peserta. Hasil kegiatan menunjukkan adanya peningkatan pemahaman guru terhadap konsep tracer study, kesiapan dalam mengelola data alumni secara digital, serta meningkatnya kepercayaan diri dalam melakukan sosialisasi tracer study kepada siswa dan alumni. Lebih dari sekadar capaian teknis, program ini mendorong pergeseran pemanfaatan tracer study dari rutinitas administratif menjadi sarana refleksi institusional dan tata kelola pendidikan berbasis data. Temuan ini menegaskan bahwa inisiatif tracer study digital akan lebih efektif dan berkelanjutan apabila diposisikan sebagai proses pemberdayaan guru, bukan semata-mata sebagai intervensi teknologis, sehingga mampu mendukung pembelajaran institusional yang berkelanjutan dalam pendidikan vokasi.

Abstract

Digital transformation in vocational education requires not only technological systems but also the empowerment of teachers as key actors in institutional governance. One instrument that plays a strategic role in this process is the tracer study, which is often implemented in a manual and fragmented manner in vocational schools. This community service program aimed to strengthen teachers' digital literacy and analytical capacity through the implementation of a digital tracer study system at SMK Kartika XX-1 Makassar. The program was conducted through five stages: socialization, capacity-building training, system implementation, mentoring, and sustainability planning. A total of 22 teachers and department operators participated in the program. Data were collected using pre-test and post-test instruments as well as participant questionnaires. The results show an overall improvement in teachers' understanding of tracer study concepts, readiness to manage alumni data digitally, and confidence in socializing tracer study activities. More importantly, the program contributed to a shift in how tracer study practices are utilized, from administrative routines toward tools for institutional reflection and data-driven governance. This study highlights that digital tracer study initiatives are most effective when framed as teacher empowerment processes rather than purely technical interventions, thereby supporting sustainable institutional learning in vocational education.

Keywords: *Tracer study, Digitalization, Teacher empowerment, Alumni*

1. INTRODUCTION

Digital transformation has become a central agenda in vocational education systems worldwide, driven by the need to align educational outcomes with rapidly evolving labor market demands. Beyond the adoption of new technologies, digital transformation requires changes in institutional culture, governance, and human capacity (Sulistyani et al., 2023; Yuangga, 2023). In vocational schools, this challenge is particularly evident in the monitoring of graduate outcomes, where systematic data is essential for evaluating curriculum relevance and graduate employability (Harianto et al., 2019).

One important instrument used to assess graduate outcomes is the tracer study. Tracer studies provide empirical evidence regarding graduates' employment status, relevance of acquired competencies, and transitions into further education or the labor market (Afia et al., 2022; Wibawa & Sujatmiko, 2021). In vocational education, tracer studies are increasingly recognized as strategic tools for curriculum evaluation and institutional planning rather than merely administrative reporting mechanisms (Sari & Mukmin, 2022). However, in many vocational schools, tracer studies remain underutilized due to their manual implementation, fragmented data management, and limited analytical use (Aklani & Yang, 2022).

In the Indonesian vocational education context, these challenges are exacerbated by constraints in digital infrastructure and human resource capacity. According to the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek, 2023), tracer study implementation in vocational schools is often hampered by limited access to alumni data, low alumni participation, and insufficient digital literacy among teachers responsible for data management. As a result, tracer study outputs are rarely integrated into evidence-based decision-making processes at the school level.

SMK Kartika XX-1 Makassar is a vocational high school with strong institutional potential, reflected in its accreditation status and diverse vocational programs. Despite these strengths, the school has faced persistent challenges in managing alumni data systematically. Previous community service activities conducted at the school revealed that tracer study practices were largely conventional, resulting in unstructured data and limited analytical value for curriculum development and institutional planning (Zuhairoh et al., 2024). These findings highlight the need for a more comprehensive approach that combines technological solutions with human capacity development.

Digital tracer study initiatives are often introduced as technical interventions focused on system development. However, such approaches risk limited sustainability if teachers are not adequately empowered to manage, interpret, and utilize the data generated. Studies on digital education transformation emphasize that technology adoption without capacity building often leads to superficial implementation and weak institutional impact (Novaliendry & Hakim, 2022; Purwadi et al., 2024).

Therefore, this community service program positions digital tracer study implementation as a teacher empowerment process. The program emphasizes capacity building in digital literacy, data management, and analytical use of tracer study results to support data-driven governance in vocational schools (Setiyawan et al., 2023). Rather than focusing solely on graduate absorption rates, the program highlights the role of teachers in transforming tracer study data into meaningful insights for curriculum evaluation, institutional planning, and engagement with external stakeholders.

Unlike previous tracer study initiatives that primarily emphasize technical system implementation, this article focuses on teacher empowerment as the central mechanism for sustaining digital tracer study practices. The tracer study is conceptualized not merely as a data collection instrument, but as a capacity-building tool that reshapes teachers' roles in evidence-based educational governance.

This article builds upon a previously accepted community service publication that reported the technical implementation of a digital tracer study system and policy-oriented outcomes at the same vocational high school (Asrawati et al., 2025). While both articles are

based on the same community service program, the present article differs in its analytical focus by emphasizing teacher empowerment and data-driven governance as its primary contribution.

2. METHODS

The main problem agreed upon with the partner institution, SMK Kartika XX-1 Makassar, is the low effectiveness of tracer study implementation. Tracer studies play an important role in evaluating the relevance of graduates to the labor market as well as in designing curricula that are more aligned with industry needs. However, their implementation still faces several challenges, which can be categorized into the following sub-problems:

1. Limited tracer study system
   Tracer studies are still conducted manually or conventionally, causing alumni data collection to be slow and unsystematic.
2. Lack of digital technology utilization
   There is no digital-based system that can automate alumni data collection, analysis, and reporting in real-time.
3. Low alumni participation
   Alumni are less active in providing information regarding employment status, challenges in the workplace, and the relevance of the competencies they obtained to industry needs.

Several potential solutions can be applied to address these problems, including the development of a digital-based tracer study system. The implementation of a digital platform enables alumni data collection and analysis to become easier, faster, and more structured. In addition, schools may develop application- or website-based systems that function to continuously monitor alumni development.

Another solution is the training of teachers and staff in the use of technology for tracer studies. This training is designed to enable teachers and staff to effectively manage alumni data using digital systems. Furthermore, mechanisms need to be developed to socialize tracer studies among alumni to increase their participation in providing information regarding employment status and the relevance of their competencies to industry demands.

The implementation of these solutions is expected to improve the effectiveness of tracer studies at SMK Kartika XX-1 Makassar. Optimizing alumni data management systems will help the school adjust its curriculum to meet industry needs, thereby ensuring that graduates are better prepared to compete in the labor market.

The tracer study program was designed using five main stages that are interconnected: socialization, training, technology implementation, mentoring and evaluation, and program sustainability. These stages aim to ensure that SMK Kartika XX-1 Makassar can manage tracer studies effectively and sustainably. The stages of program implementation are described in Table 1.

Table 1. Stages of Program Implementation

Stage	Description	Activities	Partner Participation
Socialization	Introducing the community service program and ensuring partner support.	Conducting initial meetings with partners. Sharing information on program objectives, benefits, and schedule. Conducting Focus Group Discussions (FGDs).	Actively participating and providing input during meetings and discussions. Disseminating program information.

Stage	Description	Activities	Partner Participation
Training	Providing training to partners on the application of technology and innovations offered.	- Workshops on tracer study systems. - Training and mentoring on alumni data analysis and report preparation.	- Actively participating in training and using the introduced system. - Providing feedback on training materials.
Technology Implementation	Implementing a digital-based system to support tracer study effectiveness.	- Using the tracer study website. - Processing alumni data.	- Inputting alumni data into the system. - Monitoring and ensuring data remains updated.
Mentoring and Evaluation	Monitoring and evaluating program effectiveness and challenges faced by partners.	- Evaluating tracer study results. - Conducting interviews with partners regarding program benefits and challenges. - Preparing recommendations for improvement.	- Submitting reports on system usage. - Providing suggestions for program development.
Program Sustainability	Ensuring the sustainability of the program after the community service ends.	- Providing tracer study system guides and tutorials. - Encouraging the establishment of an internal school team.	- Managing and regularly updating the system. - Integrating the program into school policies.

3. RESULTS AND DISCUSSION

The community service program was carried out in five main stages: socialization, training, technology implementation, mentoring and evaluation, and program sustainability. At the socialization stage, the team conducted a Focus Group Discussion (FGD) with the school principal and teacher representatives. This discussion resulted in an agreement on the importance of digitalizing tracer studies and strategies to increase alumni participation.

The socialization and communication stage was carried out to recruit participants who would be involved in the digital tracer study training. Instead of using an open registration mechanism, participants were directly appointed by the school principal as the team responsible for managing tracer studies in each department. From the eight departments, each sent a representative operator and a homeroom teacher, resulting in a total of 22 participants. At this stage, the community service team also conducted an FGD with the principal and teachers to identify tracer study needs and design training plans relevant to the school's context.

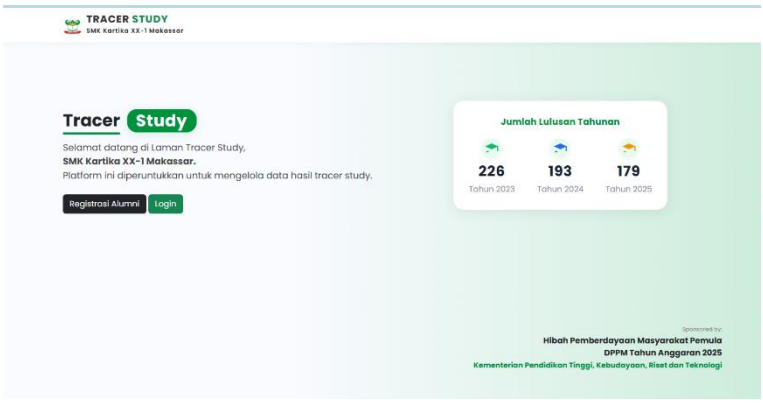


Figure 1. Dashboard of the Tracer Study Website for SMK Kartika XX-1 Makassar

The digital tracer study training was conducted in a full-day session with a total duration of six hours and was attended by 22 selected participants. Prior to the training, a pre-test was administered to measure participants' baseline understanding of tracer study concepts and alumni data management. The training featured three presenters with different but complementary expertise. The first presenter, Dr. Nur Asrawati, M.Pd., delivered material on the importance of tracer studies in vocational education. She emphasized that tracer studies are not merely the collection of alumni data, but rather a crucial instrument for evaluating curriculum relevance to industry and labor market needs. This explanation was reinforced with case examples of vocational schools that successfully adapted their curricula based on tracer study results, thereby enabling graduates to be more easily absorbed into the workforce. This material provided participants with a conceptual foundation regarding the urgency of tracer studies in supporting data-driven school policies.

The second presenter, M. Adnan Nur, M.Kom., continued the session with a focus on the design of the tracer study website and user guidelines. This session highlighted technical aspects such as login procedures, alumni data entry, data validation, and the management of the analysis dashboard, as illustrated in Figure 1. Participants were given the opportunity to directly practice using the system on available laptops or computers. This hands-on activity enabled teachers from each department to understand how to utilize the tracer study application as a systematic and integrated tool for alumni monitoring.



Figure 2. Digital Tracer Study Training Activities

The final session was delivered by Dr. Faihatuz Zuhairoh, M.Sc., who presented material on tracer study data analysis techniques and the preparation of digital reports. She explained simple analytical steps that teachers could apply to process alumni data into useful information, such as the percentage of graduates who are employed, pursuing higher education, or not yet absorbed into the labor market. In addition, she introduced a digital tracer study report format that could serve as a basis for internal school evaluation as well as official reports to the education office and industry partners. Participants showed great

enthusiasm since the material was directly related to their daily responsibilities in department management and homeroom guidance. The training implementation process is illustrated in Figure 2.

With the presence of all three presenters, the training became comprehensive, as participants not only gained theoretical understanding of tracer studies but also developed practical skills in using the digital system and analytical abilities in preparing meaningful reports. This combination of theory, practice, and analysis provided teachers with a complete learning experience, enabling them to be better prepared to manage digital tracer studies independently within their respective departments.

After the training activities were completed, a post-test was administered to measure the extent of teachers' understanding of the material that had been delivered. The post-test was designed to evaluate the improvement in participants' knowledge and skills, particularly in relation to academic writing and publication strategies. The results of the post-test served as the basis for designing more targeted follow-up mentoring. On the final day of the training, a group photo was taken with the presenters and participants.

The analysis of the distribution of pre-test and post-test scores of teachers at SMK Kartika XX-1 Makassar (Figure 3) indicated a difference in score patterns before and after the training. The boxplot shows that the median post-test score was slightly higher than the pre-test score, suggesting an overall increase in participants' understanding after the intervention. However, the wider range of post-test scores also indicates variation in comprehension levels among participants. Several low-score outliers were identified, which were likely caused by limited individual capacity in mastering technology or lower engagement during the training.

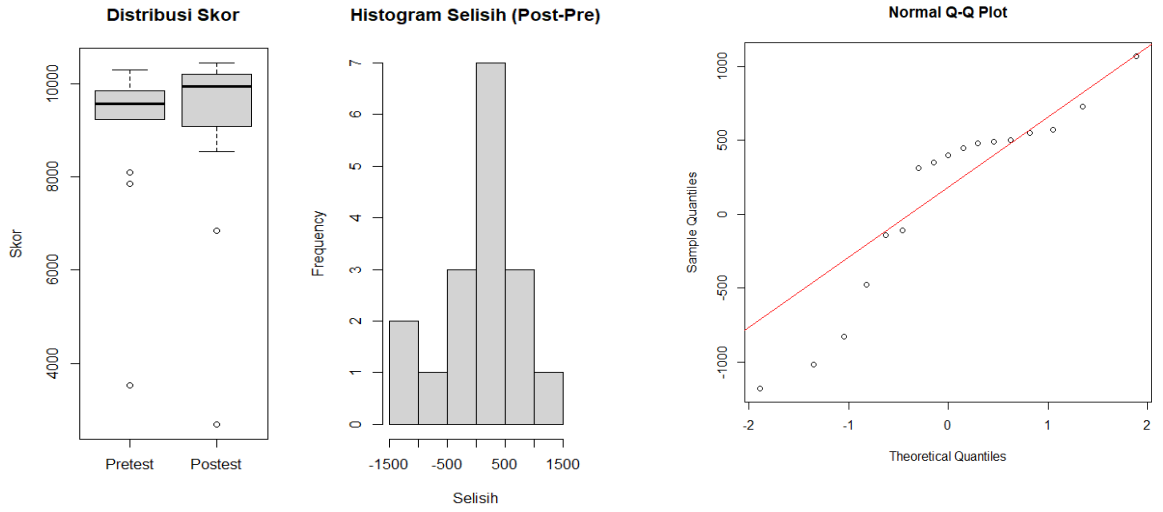


Figure 3. Histogram and QQ-Plot

Next, mentoring sessions were conducted by dividing participants into groups based on their respective departments. The mentoring focused on hands-on practice with the digital tracer study system, including alumni data entry, information validation, and the management of the analysis dashboard. These mentoring activities were carried out online via Zoom to facilitate coordination while ensuring that participants could independently explore the system's features within their own environments.

As part of the program evaluation, a questionnaire was also distributed to participants to obtain feedback on the quality of the training and the effectiveness of the digital tracer study system introduced. The results of the questionnaire provided an overview of the aspects that worked well as well as areas that still require improvement,

thereby serving as a basis for refining future community service activities. Figures 4–8 present detailed results of participant satisfaction with the digital tracer study training.

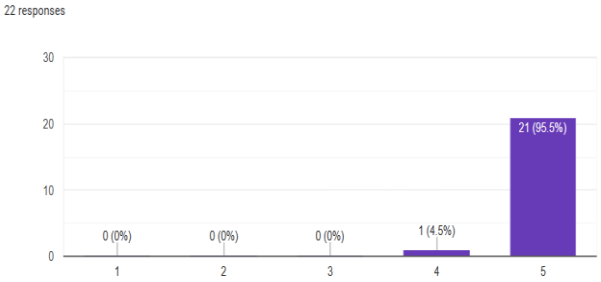


Figure 4. Diagram of Resource Persons' Master of the Material

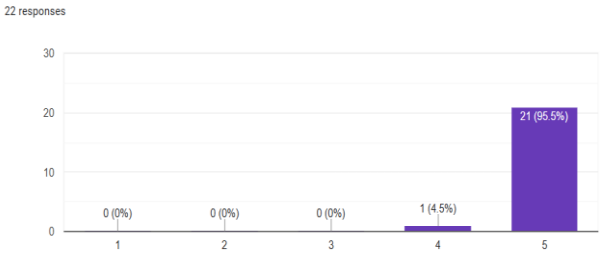


Figure 5. Diagram of the Systematic Delivery of the Material by Resource Persons

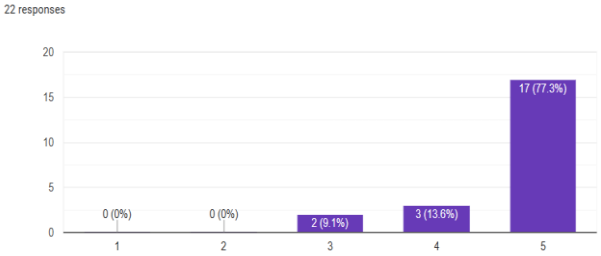


Figure 6. Diagram of Participants' Understanding of the Training Material

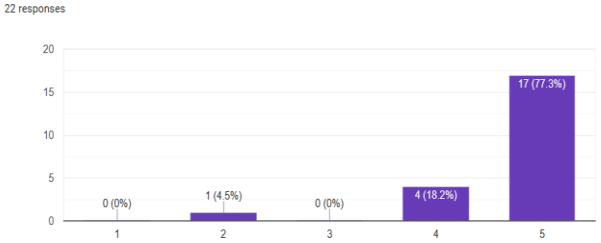


Figure 7. Diagram of Participants' Ability to Socialize Tracer Studies to Students and Alumni

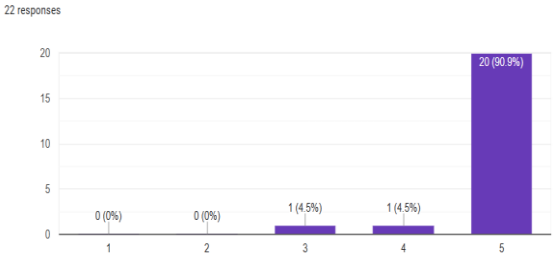


Figure 8. Diagram of the Perceived Level of Difficulty of the Training Material

Overall, the training successfully met the essential aspects of an effective program by delivering relevant and up-to-date material, presented through clear methods, and supported by competent resource persons as well as adequate facilities.

The findings of this community service program indicate that the implementation of a digital tracer study system contributed to an overall improvement in teachers' understanding and readiness to manage alumni data. The increase in post-test scores compared to pre-test results suggests that capacity-building activities were effective in enhancing teachers' conceptual and technical knowledge. However, beyond the numerical improvement, the more significant outcome lies in the transformation of teachers' roles in relation to data and institutional decision-making.

Digital transformation initiatives in education are often evaluated primarily through technological indicators, such as system functionality or data availability. In contrast, the results of this program demonstrate that the effectiveness of a digital tracer study system

depends heavily on teachers' capacity to interpret and utilize data meaningfully. This finding aligns with studies emphasizing that digital transformation is fundamentally a human-centered process, requiring shifts in skills, mindset, and organizational culture rather than merely the adoption of new technologies (Novaliendry & Hakim, 2022; Purwadi et al., 2024).

The variation observed in post-test scores among participants further highlights differences in individual digital readiness. While most teachers demonstrated substantial improvement, a small number experienced challenges in mastering technology-based tasks. This variation underscores the importance of continuous mentoring and differentiated capacity-building strategies. Similar patterns have been reported in previous studies, which note that disparities in digital competence among teachers can affect the sustainability of technology-based educational innovations (Sari & Mukmin, 2022). Therefore, digital tracer study initiatives should be designed as ongoing learning processes rather than one-time interventions.

An important contribution of this program is the repositioning of tracer study practices from administrative routines to strategic governance tools. Traditionally, tracer studies in vocational schools are conducted primarily to fulfill reporting requirements. Through teacher empowerment and digital literacy development, tracer study data in this program began to function as a source of institutional knowledge that can inform curriculum evaluation, internal planning, and engagement with external stakeholders. This shift reflects the principles of data-driven governance, where decisions are informed by systematically collected and analyzed evidence rather than intuition or ad hoc considerations (Setiyawan et al., 2023).

The establishment of a tracer study website and an internal tracer study team further reinforces the institutional dimension of this transformation. These outputs not only ensure the technical sustainability of the system but also institutionalize new roles and responsibilities among teachers. By assigning tracer study management at the departmental level, the school strengthens collective ownership of alumni data and reduces dependence on individual actors. This organizational arrangement supports the long-term integration of tracer study practices into school governance structures.

Moreover, teachers' increased confidence in socializing tracer study activities to students and alumni suggests a shift in professional identity. Teachers are no longer positioned solely as instructional agents but also as facilitators of institutional learning and external communication. This expanded role is particularly relevant in vocational education, where alignment with labor market needs requires continuous feedback loops between schools, graduates, and industry. In this sense, tracer study practices become part of a broader ecosystem of vocational education quality assurance.

From a broader perspective, this program illustrates that digital tracer study initiatives can serve as entry points for strengthening evidence-based practices in vocational schools. When teachers are empowered to engage critically with data, tracer studies move beyond descriptive statistics toward reflective tools that support institutional learning. This insight is consistent with literature on educational governance, which emphasizes that sustainable digital innovation emerges from the integration of technology, human capacity, and organizational processes.

Nevertheless, this program also reveals limitations that warrant further attention. The reliance on short-term training and mentoring may not be sufficient to address deeper disparities in digital competence among teachers. Future programs should consider longer-term capacity development models, peer mentoring mechanisms, and integration of tracer study competencies into formal professional development pathways. Such approaches would enhance the durability of teacher empowerment outcomes and strengthen the institutional impact of digital tracer study systems.

Overall, the discussion underscores that the success of digital tracer study implementation should not be measured solely by system adoption or data quantity. Instead, its true value lies in how tracer study practices reshape teachers' engagement with

data, influence institutional governance, and support continuous improvement in vocational education.

4. CONCLUSION AND RECOMMENDATIONS

This community service program shows that digital tracer study implementation can effectively support vocational education development when it is framed as a teacher empowerment process rather than a purely technical intervention. The program contributed to improved teachers' understanding of tracer study concepts, increased readiness to manage alumni data digitally, and greater confidence in socializing tracer study activities.

Beyond measurable outcomes, the program fostered a shift in how tracer study practices are utilized within the school. Teachers began to engage with tracer study data as a resource for institutional reflection and curriculum evaluation, supporting the development of data-driven governance in vocational education. The establishment of a tracer study website and an internal tracer study team further strengthened institutional sustainability and collective responsibility for alumni data management.

Despite these positive outcomes, differences in individual digital competence indicate the need for continuous capacity development. Future initiatives should emphasize ongoing mentoring and integration of tracer study competencies into professional development programs. Overall, the findings highlight the strategic value of positioning tracer study practices as tools for teacher empowerment and institutional learning in vocational schools.

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