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CRAFTING ENGINEERS FOR TOMORROW: ALIGNING EDUCATION WITH INDUSTRY TO ACHIEVE SUSTAINABLE DEVELOPMENT

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Abstract

This study addresses the critical gap between engineering education and industry demands, focusing on the integration of Industry 4.0 technologies and experience-based learning frameworks such as the MBKM program in Indonesia. By emphasizing practical skills, project management, and soft skills, this research explores how academic institutions can better prepare students for the challenges of a rapidly evolving, AI-driven workplace while contributing to Sustainable Development Goals. Using a descriptive methodology that combines case studies and literature reviews, the study evaluates the impact of industry collaboration, experiential learning, and curriculum alignment on workforce readiness and graduate employability. Findings highlight the importance of fostering adaptability, innovation, and sustainability in engineering education, ensuring that graduates are equipped to lead and thrive in dynamic professional environments. The study concludes with actionable recommendations for enhancing academia-industry partnerships, embedding lifelong learning, and advancing sustainability principles in engineering curricula, paving the way for a more robust and globally competitive workforce.

Keywords: Education; Industry 4.0; Engineering; Academic; Innovation

INTRODUCTION

The disconnect between education and industry has grown more pronounced in today's world of rapid change. Conventional educational establishments frequently find it difficult to adapt to the changing demands and specifications of the labor market (Abulibdeh et al., 2024; Mian et al., 2020). However, educational institutions are dedicated to closing this gap and getting students ready for lucrative careers in the fields they want to pursue.

A significant obstacle has been closing the gap between traditional engineering education and the changing demands of the industry. Not only is closing this gap advantageous, but it is also necessary to train the next generation of engineers who will be able to handle the challenging issues of the future. Fostering a generation of engineers ready to take on today's challenges and shape their solutions requires bridging the gap between education and industry demands.

The nature of work in the future is changing quickly, and education must adapt too! Concern over the mismatch between classroom instruction and workplace demands is growing, as it creates a skills gap that is detrimental to businesses and graduates alike. The skills that employers are looking for are changing in tandem with the industries that are constantly changing in today's fast-paced, technologically-driven world. How can we make sure that graduates have the flexibility and real-world skills necessary to succeed in the job market of the twenty-first century, in addition to their theoretical knowledge?

The sectors that propel economies change along with the world. A growing disparity exists between the skills that people possess and those that the industry needs due to a number of factors, including the evolving nature of work, the introduction of new technologies, and the rising demand for specialized skills. The mismatch between industry demands and skill sets has a big impact on education and labor demand. In order to guarantee

that people possess the necessary competencies to satisfy industry demands, it is crucial to match skills with industry needs.

Education is one strategy to close the skills gap. Academic institutions must offer programs that are industry-relevant and give students the skills that employers are looking for. Partnerships between businesses and educational institutions can help achieve this. Universities and businesses, for instance, can work together to create courses that are specifically suited to the demands of the business world. By guaranteeing that students acquire the skills that employers are looking for, this approach increases their employability once they graduate. To close the skills gap and guarantee that people possess the necessary competencies to meet industry demands, it is imperative that skills be matched with needs. Employers, individuals, and educational institutions all have a part to play in this process (Ritter et al., 2018).

The purpose of this study is to examine the advantages of utilizing Industry 4.0 technologies in higher education to help achieve the Sustainable Development Goals. The research contributes to the field of engineering education by providing insights and practical strategies for aligning academic curricula with industry demands to produce graduates who are well-prepared for the dynamic challenges of the modern workforce. By emphasizing the integration of industry-relevant practices, emerging technologies, and sustainability principles, the study supports the development of engineering programs that foster innovation, leadership, and adaptability. Furthermore, it advances the discourse on achieving Sustainable Development Goals (SDGs) through education by highlighting how tailored engineering education can contribute to creating solutions for global challenges. This research serves as a valuable resource for educators, policymakers, and industry stakeholders aiming to bridge the gap between academia and industry, ensuring that future engineers are equipped to lead in sustainable and technologically advanced industries.

RESEARCH METHOD

This study adopted a descriptive methodology, combining case studies and literature reviews, to analyze contemporary phenomena and address the gap between industry demands and engineering education. The research focused on assessing how the utilization of Industry 4.0 technologies in higher education contributes to achieving the Sustainable Development Goals. It explored the role of universities in implementing the MBKM program as a framework for maximizing experience-based learning and ensuring its sustainability. The study also evaluated the institution's commitment to equipping students with the necessary knowledge, skills, and industry exposure required for workforce readiness, highlighting key considerations for aligning educational outcomes with industry needs.

RESULT AND DISCUSSION

Higher education, like other units of social and economic activity, faces many changes with the advancement of information technology. It is a challenge for universities to continuously improve in response to the era of disruption. Innovation and applicable outputs that can contribute to enhancing the capacity and continuity of social and economic life are demands placed on all educational institutions, especially higher education (Arnhold & Bassett, 2021; Zapata-cantu & González, 2021). A tracer study is one of the crucial instruments for continuous improvement in higher education. Achieving better quality over time is the target outcome, as it is an implication of receiving input in the form of market signals and feedback on internal management performance from alumni.

Moreover, tracing alumni performance is essential for providing information on the educational outcomes produced by higher education institutions. The higher the employability of graduates and the better the match between graduates and labour market

needs, the stronger the institution's capability to produce graduates who meet these needs (job market matching). This also includes the relationship to the level of entrepreneurship generated by higher education, specifically as job creators.

The information gathered through tracer studies or alumni surveys serves as input for the operational follow-up in the management of University going forward, including in the development of study programme curricula (curriculum development) (Wahidmurni et al., 2022). Higher education institutions need to conduct tracer studies because they require feedback from alumni in their efforts to improve the educational system and management. At the beginning of the academic year, higher education institutions set the direction for educational policies based on input regarding the conditions, experiences, and motivations of new students entering the institution. This input on conditions, experiences, and motivations also determines how the institution implements educational systems and management in terms of teaching and learning patterns/processes, research, practical work, workshops, laboratories, studios, or research activities. The implementation of teaching and learning systems is also influenced by the educational policies established by the institution.

A Tracer Study is an effort to track and understand the condition of alumni some time after graduating from their studies at a particular higher education institution. Institution Tracer Study uses a Tracer Study instrument based on directions from the Ministry of Education, Culture, Research, Technology, and Higher Education as a form of evaluation of the implementation of the Main Performance Indicators (IKU) of higher education institutions in Indonesia under the Merdeka Belajar policy. This IKU evaluates whether a higher education institution is performing well. The first IKU under the Merdeka Belajar policy is that graduates obtain decent jobs. Therefore, the success of a university’s alumni in securing decent jobs, pursuing entrepreneurship, or continuing their studies significantly impacts the university's overall performance. The more alumni who achieve these milestones, the more successful the university is in achieving the first IKU.

The implementation of the Tracer Study is certainly far from perfect, but with good collaboration from various parties at some institutions, we hope that future Tracer Studies will improve. We hope that the Tracer Study report can be effectively utilized to enhance the quality of University and increase the competitiveness of its alumni in the job market.

The tracer study concept at some Universities, as previously conducted, uses a mechanism that refers to the concept and methodology presented by Schomburg (2010). In his presentation, Schomburg (2010) classifies four main pillars in tracer study activities. These pillars are: (1) Input, which includes information about students' personal data, experiences, and motivations, as well as information about the conditions and facilitation of learning; (2) Process, which includes the processes of learning and the development of students' competencies and qualifications; (3) Output, which includes knowledge, skills, and motivation, as well as the grades achieved by students; (4) Outcome, which includes the transition to their first job, the first job obtained/performed, and their capacity to contribute in their work environment. This can be illustrated in Figure 1.

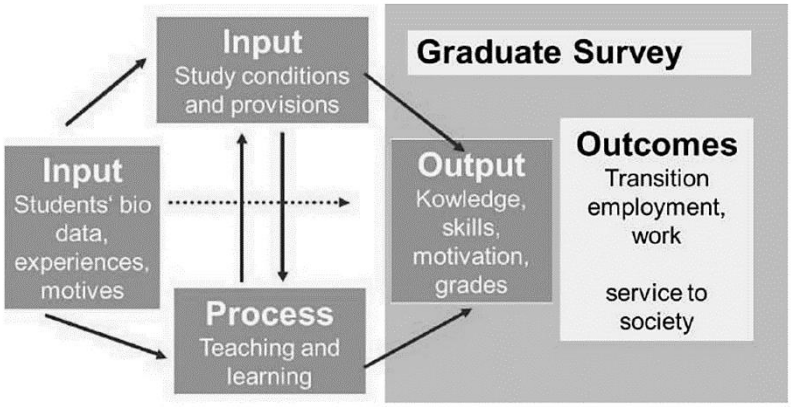

Figure 1. Tracer Study Flow or Conceptual Framework
Courtesy : Teras Academy, 2024

The results from inputs such as the conditions, experiences, and motivations of students, the educational systems and policies at higher education institutions, and the teaching and learning processes at these institutions will help shape the character and competencies of their graduates. Graduates/alumni from higher education institutions will generally possess the knowledge, skills, motivation, and competencies required to enter the workforce.

The outcomes of higher education are the knowledge, skills, and competencies of alumni needed to enter the workforce. These outcomes, along with the conditions alumni face in the early stages of their careers, are essential for higher education institutions to improve their educational systems and management. The need to understand the track record of alumni and the relationship between higher education and employment is the fundamental concept of tracer study research.

Objectives of Tracer Study

The Tracer Study aims to understand the outcomes of education in the form of the transition from higher education to the business and industrial world. It evaluates the educational outputs in terms of self-assessment of competency mastery and acquisition, the educational process through the evaluation of the learning process, and the contribution of higher education to competency acquisition. Additionally, it gathers further information about graduates as educational input.

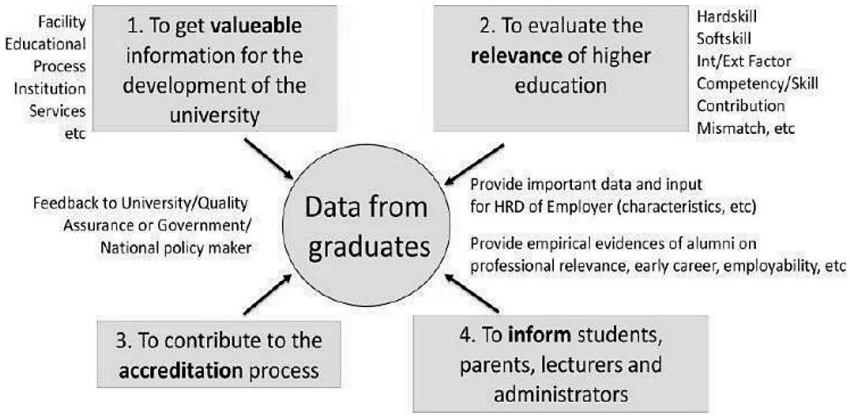

Figure 2. Objectives of Tracer Study
Courtesy : Teras Academy, 2024

The Tracer Study at University has several important objectives in its implementation. These objectives include:

1) To obtain important information in the form of alumni feedback for the improvement and development of higher education systems and management, including facilities, teaching and learning patterns, processes, and services.
2) To serve as an evaluation tool to determine the relevance of higher education to employment (hard skills, soft skills, internal/external factors, competencies, contributions, etc.).
3) To provide feedback for the quality assurance of higher education institutions or in setting national educational policies.
4) To assist higher education institutions in the accreditation process, both nationally and internationally.
5) To provide input and important data for Human Resource Departments (HRD) of companies regarding the characteristics of higher education alumni/graduates.
6) To provide empirical evidence regarding alumni in terms of employment, early careers, the relevance of alumni jobs to higher education, etc.
7) To provide information for students, parents, lecturers, educational administrators, and educational practitioners about higher education alumni/graduates.

Benefits of Tracer Study The benefits of Tracer Study are not limited to higher education institutions alone; they extend further to provide important information about the relationship between higher education and the business and industrial world. Tracer Study can offer in-depth and detailed information on job matching, both horizontally (across various fields of study) and vertically (across different levels/tiers of education). Thus, Tracer Study can help address the problem of employment opportunity gaps and efforts to improve them. For higher education institutions, information about competencies relevant to the business and industrial world can aid in curriculum improvement and learning system enhancements. On the other hand, the business and industrial world can gain insights into higher education through Tracer Study and thereby prepare themselves by providing more relevant training for new job-seeking graduates.

For University, Tracer Study is conducted to gain the following benefits: 1. As a database of alumni, recorded by Study Programme and year of graduation. 2. As an important input/information for the development of higher education institutions. 3. As an evaluation tool to see the relevance between higher education and the business and industrial world. 4. As input for improving the performance of lecturers and administrative staff. 5. As input for curriculum improvement. 6. As evaluation material for pursuing international accreditation. 7. As material for building an alumni network (Zeidan & Bishnoi, 2020).

The Free Learning-Independent Campus Policy (MBKM) is supported by the diversity of learning forms (Article 14 SN-Dikti) and the existence of facilities for students to study in three (3) semesters outside their study program (Article 18 SN-Dikti). The implementation of the Merdeka Learning-Independence Campus program is intended for Bachelor/Applied Bachelor Programs. The purpose of this MBKM is to fulfill the Graduate Learning Outcomes that have been set by each Study Program but with different forms of learning. The right of students to carry out learning activities outside their study program for 3 semesters, provides an opportunity to gain additional competencies beyond the Learning Outcomes set by the Study Program as provisions for entering the world of work after graduating from undergraduate. Besides that, The experience gained will strengthen graduates' readiness to adapt to developments in the world of work, life in society and foster lifelong learning habits.

The MBKM Curriculum is applied by study programs in 3 ways:

1) The MBKM learning process is carried out by students in Higher Education (PT) itself which can cross study programs

2) The MBKM learning process is carried out by students outside of Higher Education (PT) which can be fellow study programs or other study programs
3) The MBKM process is carried out by students with the industrial world (Internship), where apprenticeship activities will be recognized/converted into courses in the study program.

Building Tomorrow's Engineers: Connecting Education and Business

The rate of technological progress is astounding, with engineering disciplines leading the way in this wave of innovation. But there's often a disconnect between the theoretical knowledge taught in classrooms and the real-world, practical skills needed in the workplace. Rethinking engineering education to take into account the problems and circumstances that graduates will encounter in the real world is necessary to close this gap. Industry Collaborations to Establish a close relationship between leaders in the industry and educational institutions. Promote guest lectures, internships, and mentoring programs to give students exposure to and insights into the real world (Chhinzer & Russo, 2018).

Technical Knowledge: The Basis of Engineering Solutions

The emphasis on practical skills is the cornerstone of closing the gap between education and industry. Engineering curricula that incorporate experiential learning opportunities, like labs, workshops, and simulations, guarantee that students grasp more than just theoretical ideas. However, it can also be used in real-world scenarios. With this approach, graduates are given a strong skill set that aligns with the operational and technological demands of the contemporary industry. Redesigning the Curriculum: Programs for education should be updated and modified to reflect the needs and trends of the industry. Include soft skills and emerging technologies in the curriculum.

Project Management: Handling the Intricacies of Expert Projects

For an engineer to succeed, project management skills are just as important as technical expertise. Students are better prepared to lead projects from start to finish while juggling time, money, and quality constraints when project management concepts and techniques are integrated into the engineering curriculum. Moreover, project management training develops leadership and accountability, traits that are crucial in any engineering position. Immersion Learning: Utilize your hands. Put more emphasis on practical application and less on rote memorization. Use case studies, simulations, and project-based learning to develop students' critical thinking and problem-solving abilities (Donovan et al., 2022).

The Soft Skills Formula: Increasing Teamwork and Creativity

The engineers of the future are innovators, team players, and communicators in addition to being technical experts. For this reason, it is crucial to incorporate soft skills training into engineering education in order to produce professionals who are well-rounded. The secret to reskilling and upskilling is lifelong learning. Promote opportunities for lifelong learning for both professionals and students. To stay on top of developments in the industry, provide webinars, workshops, and certifications (Anjum, 2020).

Collaboration and Communication: The Innovation Bridges

In the collaborative world of engineering, effective communication and teamwork are essential. Educational institutions make sure that graduates can work well in multidisciplinary teams, clearly communicate complex ideas, and contribute to a culture of innovation, ethics, and shared knowledge by including these soft skills into the curriculum. Development of Soft Skills: Develop the necessary abilities. In educational programs, place a strong emphasis on

leadership, teamwork, communication, and flexibility. Educate students to be successful in dynamic, team-oriented work environments (Hadiyanto et al., 2021).

Adaptability and Ongoing Education: Keeping Up with the Times

In the world of technology, change is the only constant. Engineering programs that foster flexibility and a dedication to lifelong learning equip students for a career that is defined by change. Stressing the value of keeping up with new developments in technology and business practices helps graduates stay competitive and relevant in the workforce. Accept Technology: Make use of innovation's power. Include data analytics, AI, and machine learning in the field of education. Teach students how to use these resources to improve their decision-making and productivity (Lombardi, 2019).

Career Counseling and Placement Assistance

The institution is aware of how critical it is to assist students in determining their career paths. The organization offers complete career counseling services, which include personality development workshops, interview preparation, and resume building. Furthermore, the College maintains a specialized placement cell that works nonstop to match students with possible employers and job openings. Students' placement prospects are greatly enhanced by the institution's strong industry connections and alumni network, which guarantees a seamless transition from education to employment. Career Guidance and Counseling: Offer individualized assistance. Provide career guidance and counseling to students so they can build professional networks, consider a variety of career options, and make well-informed decisions about their future. Feedback Loop: Ongoing enhancement. Create a feedback loop between academic institutions and business associates to guarantee that courses stay current and aligned with evolving industry needs (Soundararajan et al., 2020).

Curriculum Relevant to Industry

Careful planning is needed to ensure that the curriculum complies with industry norms and specifications. The organization works closely with professionals and industry experts to guarantee that the programs it offers are current and applicable. The newest developments, methods, and technologies are incorporated into the curriculum at college to give students the knowledge and abilities that employers value. Adaptable Learning Pathways: Meet a range of needs. To meet the varied needs of professionals and students, provide a range of learning formats, such as blended learning, online courses, and micro-credentials.

Knowledgeable instructors with a background in the industry

Faculty members are one of the main differentiators, as they bring a wealth of industry experience to the classroom. Professionals with a range of industry experience and firsthand knowledge of expectations make up the faculty. To close the gap between theory and practice, they provide case studies, real-world examples, and practical insights in addition to theoretical knowledge (Zeidan & Bishnoi, 2020).

Industry Partnerships and Internships

Institutions have faith in the effectiveness of hands-on education. The institution collaborates with well-known companies and offers extensive internship programs to give students practical exposure to the industry. These chances give students the chance to put what they've learned in the classroom into practice, obtain useful industry experience, and expand their professional network. Students gain practical skills, industry-specific insights, and a deeper understanding of their chosen field by working alongside professionals in the industry. Certifications Relevant to the Industry: Verify your knowledge and abilities. Urge

students to obtain certifications recognized by the industry in order to showcase their skills and improve their employability (Mustafa, 2019).

Guarding Digital Transformation, The Directorate General of Higher Education, Research and Technology Launches Guidebook for Transforming MBKM Education

Independent Learning-Independent Campus (MBKM) policy launched in 2020 by the Minister of Education and Culture, where in the MBKM Policy in general provides the right to study for undergraduate and applied undergraduate students by following the entire learning process in study programs (*prodi*) at universities according to the study period and load. The MBKM Policy is implemented in order to realize an innovative learning process so that students can achieve learning outcomes covering aspects of attitude, knowledge, and skills optimally so that they have non-technical skills (soft skills) and technical skills (hard skills) which in the future can be used as capital in facing the business world and the industrial world, and are ready to face the world of work from the start.

The Directorate General of Higher Education, Research and Technology (*Ditjen Diktiristek*) through the Directorate of Learning and Student Affairs (Belmawa) officially launched two books regarding the transformation of the use of AI in higher education, in Jakarta, on Friday 11 October 2024. The two books are entitled Guide to Using GenAI in Learning in Higher Education and Leading Change in the Transformation of Higher Education in Indonesia.

One of the books is a form of educational transformation through the MBKM program where the implementation of MBKM has provided significant changes in the quality of higher education, especially the quality of students in gaining access to employment. During the five years this program has been running, MBKM has produced many positive impacts for its participants. Sri explained that the second book was the result of work written by experts who were directly involved in implementing MBKM activities. The MBKM program is well aware that it has provided students with extensive opportunities to develop relevant skills in the world of work.

The MBKM program had brought benefits from various aspects for students. One of them is supporting vertical mobility. In this book, we can see that MBKM provides many benefits for students, such as academic benefits, social and financial benefits. MBKM helps graduates to get jobs faster with higher income. This shows that there is potential for vertical mobility.

In the midst of increasingly massive technological changes, the MBKM program is a concrete manifestation of maximizing experience-based learning space that cannot be replaced by the presence of AI. Implementation of this program requires participation from universities to carry out MBKM independently so that the sustainability of the program can occur.

There needs to be participation from universities to hold the MBKM program independently. If MBKM has become a culture then the sustainability of the independence program can occur. This book tells the story of the MBKM program's journey, both its impact achievements and outcomes, which can be read in full via the link: s.id/BukuMBKM.

The Independent Campus Learning Program (MBKM) is a program launched by the Minister of Education and Culture which aims to encourage students to master various sciences to prepare them for entering the world of work. The Independent Campus Learning Policy is in accordance with Minister of Education and Culture Regulation no. 3 of 2020, which gives students the right to study outside their study program for 1 semester and carry out activities outside of higher education for 2 semesters. The MBKM program prepares students to become strong individuals, in line with the needs of the times, and ready to

become leaders with a high national spirit. To make this innovation a success, the government also provides various relevant programs.

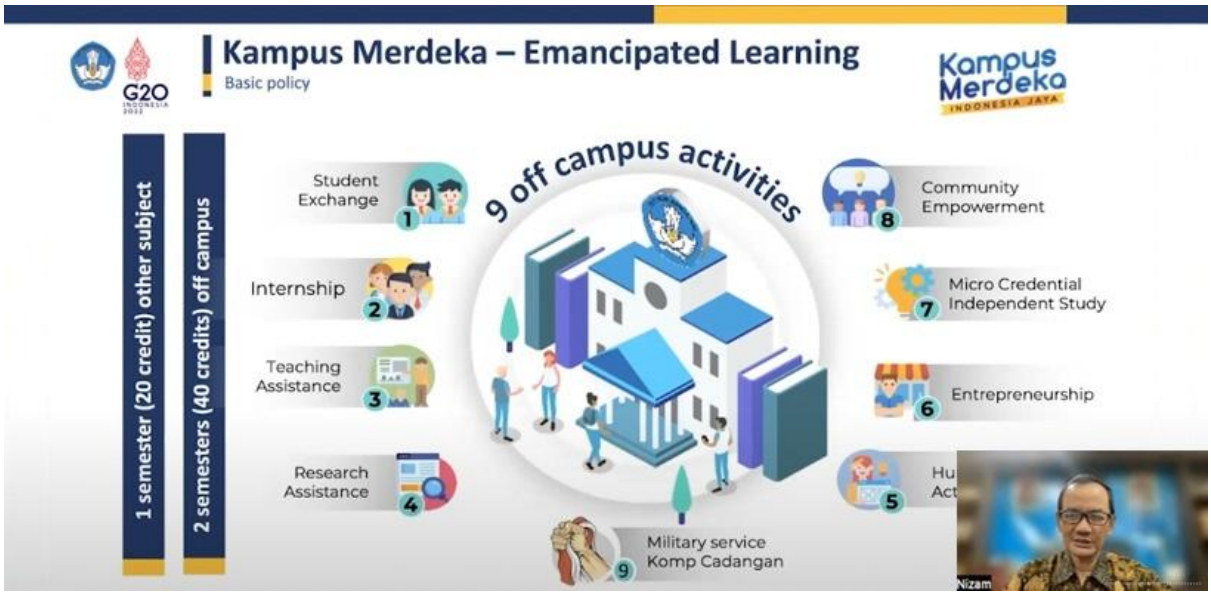

Figure 3. 9 off campus activities
Courtesy : Kemdikbud.go.id, 2024

It is hoped that this program can be a way to produce university graduates who are in line with current developments, advances in science and technology, demands of the world of work, and the dynamics of society. The Independent Campus Program (MBKM) has been launched since the end of January 2020. Based on data from the Ministry of Education and Culture's Independent Campus website, there are more than 725,000 students registered and already have Independent Campus accounts, as well as 1,300 universities that have participated in the Independent Campus program.

Objectives of Independent Campus (MBKM)

Basically, the aim of the Independent Campus (MBKM) program is to prepare university graduates who have soft skills and hard skills that are mature and relevant to the needs of the times. That way, the number of unemployed graduates in Indonesia can be reduced. Independent Campus (MBKM) also aims to prepare graduates as future leaders of the nation who are superior and have personality. Furthermore, another aim of the Independent Campus (MBKM) program is to facilitate students in developing their potential in accordance with their passion and talent through experiential learning programs with flexible pathways.

Benefits of Independent Campus (MBKM)

If the implementation of the Merdeka Campus is successful, the quality is guaranteed and sustainable, there will be many parties who will benefit. Starting from students, university graduates, lecturers, to the world of work. For students, the benefit of the Independent Campus (MBKM) is that they get wider opportunities to explore their interests and talents while studying in the Applied Undergraduate Study Program. Meanwhile, for university graduates, the benefits gained from participating in the Independent Campus (MBKM) program are obtaining specific work skills and soft skills that are relevant to entering the information society and Industry 4.0.

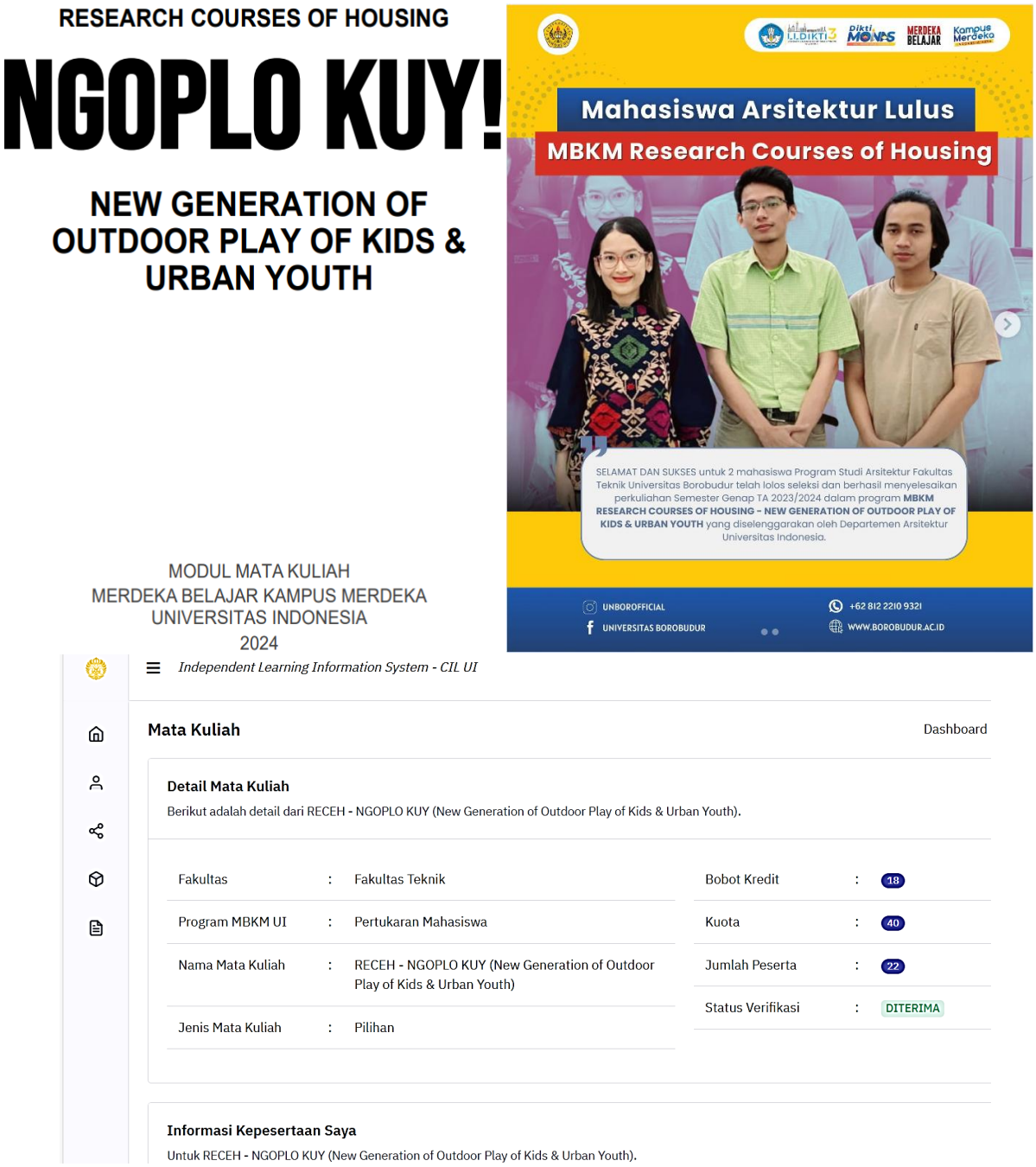

Figure 4. Architecture students of Universitas Borobudur finished MBKM program's UI
Courtesy : Unborofficial instagram, 2024

The benefits of the Independent Campus (MBKM) program obtained by lecturers are increased pedagogical abilities and mastery of learning substances. Meanwhile, for the world of work, the Independent Campus (MBKM) program can provide benefits in the form of workers who can be relied on to become leaders, as well as workers with special work skills and soft skills that are relevant in carrying out work in the Industrial 4.0 era.

Independent Campus Program (MBKM)

There are eight types of programs provided by the Independent Campus (MBKM). Starting from internship programs, student exchanges, teaching assistants in educational units, research or research, humanitarian projects, entrepreneurial activities, independent

studies or projects, to building villages (Thematic Real Work Lectures). MBKM programs are as follows :

1) MSIB: The MBKM program is one of the government's efforts to create future generations who have superior and competent personalities. This program also facilitates students to develop their interests and talents according to their passion. To make this happen, the government has also launched the MSIB program. MSIB stands for Certified Independent Study and Internship. This program is part of the Independent Campus which allows students to convert the courses they take and seek experience outside campus. The experience that academics gain from outside campus is an effort for students so that they can have the best skills. So that in the future they will emerge as quality graduates who have special skills and are ready to work in the industrial era 4.0.
2) *Wirausaha Merdeka* or Independent Entrepreneur: As the name suggests, Independent Entrepreneurship is a program that gives students the freedom to study in the field of entrepreneurship. This program is part of the MBKM innovation which aims to create graduate candidates who are interested in the field of entrepreneurship. To make this a success, students can study the field of entrepreneurship for one semester. The place is at the university selected by the implementing party. In this activity, academics will have the opportunity to develop themselves to become entrepreneurs, explore self-equipment in the field of entrepreneurship, create business concepts, analysis and so on. When participating in this program, students will have practical experience of entrepreneurial activities. This experience will be very meaningful for their future lives, especially when they enter the world of work.
3) *Kampus Mengajar* or Teaching Campus: For students who are interested in the world of education, they can take advantage of campus teaching programs. The teaching campus is part of MBKM which provides opportunities for students to learn to become teacher partners and go directly into the field. This program will give them the opportunity to study off campus for one semester and train as teachers at various educational institutions. Students are challenged to create the latest breakthroughs, think creatively, create innovative learning models, and develop various other strategies in the learning process.

IISMA

IISMA is an abbreviation for Indonesia International Student Mobility Award. This is part of a government program that gives students the opportunity to experience the sensation of studying abroad. This program applies to students studying from semester 1 to semester 7. So the government will provide scholarships and fund Indonesian student mobility programs at various foreign universities. This program will provide new experiences to academics. So they can experience studying in a new environment, get to know different cultures, and have international networks. This will provide new and impressive experiences for students. And have a big impact on their future careers.

***Praktisi Mengajar* or Teaching Practitioner**

MBKM is part of the latest innovations in the education sector. One program that is quite interesting to study is practitioner teaching. This program is an initiation from the Ministry of Education and Culture which combines lecturers with expert practitioners.

With this innovation, champion lecturers and expert practitioners will collaborate and exchange knowledge. So that later new innovations in teaching will be created which will have a big influence on the academic system in a university. This teaching practitioner

program can be carried out using online or offline methods. This program provides students with the opportunity to absorb knowledge from relevant sources who have the best expertise in their fields.

***Pertukaran Pelajar Merdeka* or Independent Student Exchange**

Furthermore, there is also a flagship program from the Merdeka Campus, namely the Independent Student Exchange. This innovation is also part of MBKM which aims to provide new opportunities for students. In the student exchange program, students have the opportunity to study at universities from other clusters, but which are still in the same region of Indonesia. To be able to enjoy this rare opportunity, a student must meet the applicable requirements and qualifications. One of them is that they must have received 20 credits of course credit recognition.

After meeting these qualifications, students can apply to take part in the Independent Student Exchange program. They will get the opportunity to practice self-confidence, leadership and social skills. This will be very helpful for these students in the future. As well as making them become strong individuals and have superior competitiveness as a preparation for entering the world of work.

***Bangkit* or Rise**

The next MBKM program is to rise. Bangkit is an open program that students can take part in. This program is a collaboration between the Ministry of Education and Culture and various parties such as GoJek, Traveloka, Tokopedia and others. In the Bangkit program students can study various learning topics. Among them are mobile development, machine learning, and cloud computing.

***Gerilya* or Guerrilla**

Guerrilla is a Pentahelix collaboration program between the Ministry of Education and Culture and state-owned/private parties, the media, and the community. This program is part of the Merdeka Campus which aims to improve students' human resources. The aim of this activity is to increase technical experience and provide training related to the energy transition program being launched by the government. The renewable energy program is one that is being launched by the government and is part of the Guerilla program. Students who are members of the science and sociohumanities study program have the opportunity to join this program.

These are some of the programs available at MBKM. MBKM is an innovation from the Ministry of Education and Culture that deserves to be appreciated. Because with this program it is hoped that students will be ready to face changing dynamics in the world of work. As well as having superior competitiveness both at national and global levels.

CONCLUSION

This study emphasizes the importance of bridging the gap between academia and industry to equip students with the skills, confidence, and adaptability needed for success in an evolving workplace. By integrating practical skills, project management, and soft skills into engineering curricula, institutions can prepare graduates to lead and innovate in complex industrial landscapes. The MBKM program serves as a vital framework for experience-based learning, enabling universities to align education with industry demands while fostering innovation, adaptability, and teamwork. Future research should explore the long-term impact of MBKM programs, the integration of AI in practical learning, industry collaboration models, and the role of lifelong learning in sustaining workforce readiness. Additionally, cross-cultural studies on academia-industry alignment and embedding sustainability

principles into engineering education can provide valuable insights for creating a globally competitive and sustainable workforce.

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