

THE ENTREPRENEURSHIP LEARNING IN INDUSTRIAL 4.0 ERA (CASE STUDY IN INDONESIAN COLLEGE)

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ABSTRACT

The aims of this paper is to discuss the skills for students in the form of entrepreneurship learning which can be written in university curriculum in Indonesia to face the industrial revolution 4.0, In-depth interviews were carried out by involving 60 lecturers in Entrepreneurship groups from various universities in Makassar City and Jakarta Indonesia and continued through focus group discussion (FGD) to reach understanding related to curriculum content that was effective in facing resurrection industrial revolution 4.0. this research has four stages: (1) Phase of skills Mapping (2) Compilation of the structure of the course (3) determination of learning strategies (4) Special observations on Adaptation to Industrial Revolution 4.0 at Bina Nusantara University Jakarta (participant observation). This research find the course arrangements, can be grouped into three important literacy, namely 1) Data literacy 2) Technology Literacy and 3) Human literacy. They are contained in 40 subjects in over seven semesters. This study also recommends that the classroom learning should integrate to the field learning in the form of more intensive apprentice program.

Keywords: Entrepreneurship Learning, Industry Revolution 4.0.

INTRODUCTION

The industrial revolution 4.0 raises a variety of new public issues, such as; the online transportation polemics, the e-commerce threats to conventional stores/retailers, the cybercrime and the virtual offices problem where people should not work in office anymore. There is also the most serious challenge for the younger generation that is the jobs for human labor will be replaced by other machines, robots and artificial intelligence.

The Higher educations are also faced problem of existence; Clifton (2016) worried much about the future role of higher education in supplying industrial labor in the world. This article is triggered by Google and Earnest & Young advertisement. They will pay anyone who will join them without even having any diplomas, including college diplomas. It implies that a person with good skill will be more valued in the current industrial market even though they do not have diploma from higher education. A similar article by Eagleton (2015), in his writing, he discussed about the slow death of the university.

To response the above issue, the university, in order to graduate high competitive and ready labor for the world of work, they must hire lecturers who have strong scientific competence, the lecturers must be able to adapt to the industrial revolution 4.0. The learning patterns can no longer use the old patterns of curriculum. The learning system must be developed to be more adaptive to market needs, it should contain with a field practice approach, involving industry and business actors in the apprentice program. The most basic question is: Are universities in Indonesia ready to face the industrial revolution 4.0? How do universities prepare structures and infrastructure in the era of revolution industry 4.0?

REVIEW OF PREVIOUS STUDY

Industrial Revolution 4.0 and Its Implications in Indonesia

Industry 4.0 is the name of the automation and data exchange trends in factory technology. This term includes the physical-cyber systems, the internet, and the cloud and cognitive computing (Hermann et al., 2016; Jasperneite, 2012; Kagermann et al., 2013; Lasi et al., 2014). Industry 4.0 produces "*smart factory*". It contains the modular structures, the cyber-physical systems (to observe the physical processes), to create copies of the physical world virtually, and to make un-centralized decision. Through the Internet (IoT), the cyber-physical systems will communicate and cooperate each other and to humans at the same time. Through cloud computing, the internal and cross-organization services, are provided and used by any community in the value chain (Hermann et al., 2016).

The term "*Industrie 4.0*" comes from a project in the advanced technology strategy which run by the German government. They focused using computer in factory. The term "*Industrie 4.0*" was reappointed at the Hannover Fair in 2011 and in October 2012. We must admit that the industrial revolution has big contribution on the existed condition to the revolutionary change. Not only as the challenge but also to become an opportunity. Therefore, to anticipate the impact of these changes, it is necessary to make an habit adjustments, not only as the culture but also should become the disciplines, that have been studied for many years. The learning content must be evaluated, so it must be in line towards the environment needs in the framework of industrial revolution 4.0.

Mello (2015) stated, there are at least three impacts for organizations as the response to the new technological changes, namely:

1. The need to improve the skills and the work habits of the employee.
2. The elimination of low-level positions and managerial levels.
3. Hierarchy reduction (it is because the work will be more oriented to the cooperation or collaboration).

Therefore, the workers in the industrial era 4.0 will be dominated by self-directed, striving for the personality-valued career outcome (Hirchi et al., 2015).

The analysis which was conducted by The McKinsey Global Institute, cited by Haryono (2018), estimates that "*50% of the field work are potentially to be changed with new*

technologies". Although less than 5% of jobs can be fully changed, but 60% of them, can have 30% of their activities or more, might be technically changed. The activities, such as collecting and processing data, physical activity and operating machine, they have the highest potential for being changed. On the other hand, the activities that involve the interaction with stakeholders, for decision making, for planning and for assignment creative tasks, or for managing and developing, they have less potential to be changed.

Haryono (2018) further stated that the potential level of automation varied not only among sectors but also countries as the whole, the number of activities that could be changed automatic, will be affected 1.2 billion employees. More than 50% of automatic changed jobs are spread in China, India, Japan and the United States. China and India have the greatest potential for technical employment that can be automatic changed, equal to 700 million full-time employees among them. In France, Germany, Italy, Spain and the United Kingdom, there are 62 million full-time employees technically can be automatic changed. No wonder, salary is negatively correlated to the potential for technical automation. The factors that influence the speed and the level of automation are, the costs of developing and implementing solutions to the labor market dynamics, the economic benefits and legal law, and the community acceptance.

The impact of the industrial revolution that occurred in various countries is also faced by Indonesia. The readiness for Future Production Report in World Economic Forum, stated that to face Industry 4.0 in terms of production structure, Thailand is considered ready. Vietnam and Indonesia are still behind because they are categorized as nascent countries in driver and structure of production, it means that their existence have just begun, to be potential, but need to work harder than other countries.

One of the sectors that being affected by the industrial revolution in Indonesia is, the education sector, particularly, the Higher education. To anticipate the rapid changes, the higher education is directed at achieving economic growth by encouraging graduates to create jobs through entrepreneurship. The efforts that have been made are:

- A. Integrating the Leadership, the management, and the business skills to curriculum.
- B. Integrating the digital literacy, the information and communication technology, the computing skills and the coding to curriculum.
- C. Developing the non-cognitive inclusion (socio-emotional skills throughout the curriculum.
- D. Fostering the common values (tolerance, empathy, non-discrimination, human rights, a culture of peace, non-violence and sustainable development in the curriculum.

The Role Requirement of University in Indonesia during the Industrial Revolution 4.0

The Fourth Industrial Revolution, commonly known as Industry 4.0, appears to be changing the way business function and, by extension, the stakes by which they are forced to compete. Organizations must decide how and where to invest in these new technologies and identify which ones might best meet their needs. Without a full understanding of changes and opportunities Industry 4.0 brings, companies risk losing ground. (Deloitte Insight, 2017)

From the statement above, it shows us that the correct understanding of the industrial revolution 4.0 will be the key to success. For this reason, the right teaching system is a very significant factor to overcome this problem. Today, the University must have begun to well organize the teaching and learning process which oriented to the demands of change and to process adaptively to those demands (Hidayat et al., 2015; Durmus & Dağlı, 2017). The pattern of teaching must be developed to consider to the education output. They have to have the great skill in line with the demands of the main characteristics needed in this era of change.

The main characteristic of industrial progress 4.0 is the interaction between machines and machines. It may cause the reduction of human operator's role and the increasing of higher competence human labor. In addition, the paradigm change in human relations and management as an impact of technological progress is also as a challenge that needs to be anticipated carefully. Therefore, to meet the demands, the education must be more adaptive to the needs in the field. With this, It can bring the teaching pattern to be more creative and innovative for students. More than that, the students will have good advantage to compete not only in national but also in the global level.

The research on redesigning thinking in education to face the 4.0 industrial revolution has been carried out by experts in some countries. The implications of the 4.0 industrial revolution are shown as in Thailand, it shows that the University has created education with the creative society concept as a good strategy. The concept builds creativity, innovation, inclusiveness and sustainability. In addition, developing to learning networks, public-private-community involvement, new mind-sets and skills of lecturers and students, and new technologies, are built next to support the successful implementation (Buasuwan, 2018).

Meanwhile, at Bina Nusantara Indonesia University, in order to face the industrial revolution 4.0, they have arranged all courses to the needs of it with a program called track 3 plus 1. The program is given to students to choose one year outside by doing internship, entrepreneur, research, community service and study abroad (for two semesters). The awareness to face the industrial revolution 4.0, gives also good signal to some universities in Indonesia by making such symposium, seminars, and developing infra structures (information and technology in particular).

The Entrepreneurship Learning Materials in Higher Education to Face the Demands of the Industrial Revolution 4.0

To answer the challenges of the industrial revolution 4.0 era, the education in University is not enough just to stand on the old human literacy by doing only the basic ability to read, to write and to count (Haryono, 2018). The human literacy today, must cover everything that exists in its environment holistically. According to Aoun (2017), to obtain the competitive human resources in industrial revolution 4.0 era, the curriculum must be designed for students to master the new literacy, namely:

1. **Data Literacy:** According to Tansley & Tolle (2009), data literacy is an ability to understand, to analyze and to use the Big Data in the digital world. It is expected that someone is able to manage big data

including reading the data, to understand the data and to communicate with the data as information, Na & Yan (2013) stated that now, mastering the data literacy is becoming the most important role for students and society. In the entrepreneurship education issue, mastering the data literacy, it is very important in the world of entrepreneurship, it is because the current data management becomes the crucial demand especially in terms of: (1) Understanding the market conditions; (2) Understanding the customers better; (3) Controlling to the online reputation; (4) Cost saving which relates to IT data management.

2. **Technology Literacy:** It is the ability to use, to understand and to access technology (Dugger, 2002), literacy technology is the ability to use technology effectively in order for accessing, evaluating, integrating, making and communicating, to improve learning process through solving problems and critical thinking. The technology literacy also includes for understanding information management, for understanding how the machine workings, and for understanding the applications of technology (the coding, the artificial intelligence and the engineering principle). The empirical facts prove that technology and entrepreneurs cannot be separated. As Nigerian researchers said that there is a strong relationship between technological development and entrepreneurship.

The technology makes the dynamics of entrepreneurship; the information and technology, in the same time, encourage diversification and economic scale. Some reasons have made the SME (UKM) to grow slowly in Nigeria, due to poor infrastructure, poor skills, limited access to finance, limited access to markets and low absorption in research and technology. The problems in the industry can only be solved by both businessmen and researchers, and support and cooperation from government (Okorie et al., 2014).

3. **Human Literacy:** It consists of social and emotional learning. The term talks about the importance of values-based education, to promote safety (including Cyber security), to maintain a growth mind-set, and to support students to become innovative and action subjects (Maramba School, 2019). The Human Literacy consists of 5 key elements, they are: Social, Physical, Intellectual, Cultural and Emotional (known as the S.P.I.C.E. element). (1) Socially, the students need to know how to develop a strong relationships, to become a team leader and a player, and to become proactive citizens for online and offline. (2) Physically, the students must be able to make healthy choices that support body and neurological development. We currently need students with an environmental conscience who can act as the environmental change agent. (3) Intellectually, the students need to be innovative and reflective problem solvers who are able to respond to new challenges, to set goals based on the value and to achieve success. (4) Culturally, students need to know that they are important, and to develop a growth-mind-set that will support their attitudes, identities, and positive views. (5) Emotionally, students must be able to understand their emotions, to be able to bounce back from difficulties and to develop emotional intelligence that will help them to grow.

Referring to Aoun (2017), about human literacy, in preparing human resources, in general, the university needs to:

1. Improve the quality of human resources.
2. Increase the Quantity of human resources quality.
3. Distribute the human resources equally.

The efforts to meet these needs, have been carried out through the implementation of teaching and learning process in University and others are to run program including the apprentice and professional certification. There are any programs that also very useful for students, they are the encouragement from the government to improve quality goes through the standards of the Indonesian National Competency Qualification (KKNI). It has been translated by Universities as the curriculum compilation through KKNI-based curriculum.

The skill is an important point for every college. It is the basic for the implementation of education and teaching. By having good skill, the out put will be able to solve problems and to make the right decisions, because skill is the basic need of someone to apply the way of thinking, the way of working, the tools for working and the skills for living in the world.

According to Aoun (2017) in (Haryono, 2018), to obtain competitive human resources in industrial revolution 4.0, the education curriculum must be well designed, therefore the output is capable of mastering new literacy, namely:

1. Leadership skills and work skills in the teamwork.
2. Mature in agility and culture (cultural agility). Both are very important because they talk about the attitude of tolerance and understanding, also to appreciate others who have diversity in backgrounds but keep cooperative.
3. Entrepreneurship, it is the ability to create and to improve business, also to develop themselves for something valuable in financial in the future.

However, the education which is associated with human literacy must pay attention most to the five basic personality, they are; extravenuous, agreeableness, conscientiousness, emotional stability and openness to experience (Mount et al., 1994). The other aspects for Human Resource success such as the emotional intelligence, and the spiritual intelligence (Prasadja & Agustian, 2000). They cover about self-awareness, emotional management, self-motivation, empathy, managing relationships, communication skills and personal style.

Haryono (2018) said, at the organizational level, the concept of Resource Based View (RBV) by Barney et al. (2001), it is still very relevant in the industrial revolution 4.0 era. The concept of RBV talks about the excellence company's competitive is obtained through the great of strategic resources. It is rare and unique, expensive to be followed and difficult to be replaced by competitors. The Resource Based Value has three dimensions, namely:

1. Tangible resources consist of: financial, physical, technological and organizational.
2. Intangible resources consist of: human, innovation, relativity, and reputation.
3. Organizational capabilities consist of: outstanding customer service, excellent product development capabilities, innovation of product and services, and the ability to receive, to motivate and to maintain the capital of human resources (to hire, to motivate and to retain human capital). How can this situation occure in Indonesia?

Some Universities in Indonesia have used the Big Data such as scale and siak-ng in e-learning. It is used for data collection. The Bina Nusantara University (Binus) uses Binus Maya for lecturers and students interaction, students and Binus administration, Binus Management and parents. Beside that the program is also useful for Lecturers communication, information about lecturers honorariums and teaching schedules, even with domestic and foreign industries or universities by using the Global Learning System (GLS). Through this, the RBV concept can be fulfilled, especially for organizational capabilities. STIE Nobel Indonesia Makassar has implemented the e-learning application where includes the learning reporting and the academic evaluation, it is intended to accustom the students using technology and information.

METHODOLOGY

This research is a qualitative descriptive study that intends to translate the skills that are needed in the industrial revolution 4.0. It comes from the opinion of researchers and experts to take entrepreneurship into a unit of study in the effort to develop a university curriculum. The data collection was carried out by having interview method with involving 60 lecturers in Entrepreneurship subjects from various universities in Makassar and Jakarta in Indonesia. It continued to focus group discussion (FGD) program to reach a mutual understanding which relates to the curriculum content and the effective learning strategies where focused in three main things in the learning process, namely:

1. Data literacy.
2. Technology literacy.
3. Human literacy.

The study will conclude it as the college strategy in entrepreneurship learning to face the challenges of the industrial revolution 4.0.

This research is carried out through the following stages:

1. To map skills into subject units. In this case, one skill can be placed into one or more subjects.
2. To arrange the course structures. It aims to determine the composition of courses from semester one to last semester.
3. To determine the learning strategies in universities.
4. To run the program for Adaptation of the Industrial Revolution 4.0 at Bina Nusantara University Jakarta through the concept of apprentice program (participant observation).

RESULT AND DISCUSSION

Mapping the Skills into the Subject Units

The results of this study begin by mapping the abilities of the output; they are taken from previous results of research studies then being taken again into a discussion with the respondents. The abilities, later, will be grouped and placed into subject units that contain in current curriculum. The mapping of capabilities above can be seen through the table as shown at Table 1, that we can see the abilities in the data literacy group can be accommodated into courses that currently applied generally by universities in Indonesia. The above lectures have main subject and sub-subject which relate to literacy data and they must be understood by students. The Focus Group Discussion (FGD) notes that what need to be changed is about how the students understand the data, to interpret them and to be able to manage the data by using modern technology.

Expertise Mapping in the Field of Data Literacy

There are 6 skills that must be possessed by students in data literacy groups, based on the Table 1 below, namely:

1. Analysis and understanding data.
2. Utilizing big data information.
3. Understanding the market condition through data.
4. Understanding the customer's data.
5. Control and build online reputation.
6. Cost savings through data.

These skills will be conveyed in 17 subjects, namely subjects that have involved in data analysis related to the ability of students to read data, use data and interpret data.

Among the 6 skills in data literacy through dissemination in a course some expertise can be discussed in one course through the subjects contained in the course as an example of expertise in the Analysis and understanding the data, Utilizing big data Information and Understanding the market conditions through data is contained in a research operational course which in its discussion is closely related to these skills.

Considering to how difficult interpreting the data by students, the researchers from UIN Sunan Ampel Surabaya and Surabaya State University, they conducted experiments about the way female and male students to read. The result of this study indicates that in interpreting the data, the differences occurs based on the gender. Therefore, the university must add a curriculum that provides skills for the students in translating the data. (Hafiyusholeh et al., 2018).

Expertise Mapping in the Field of Technology Literacy

Expertise mapping in the field of technology literacy, resulted 7 skills that are important for student to possess, which will be delivered in 10 courses based on technology and information. The result of this study recommended that the provision of technology-based courses should be emphasized on the practice and implementation of field work both collaboration with the business world and business actors as an example, e-business courses must be taught by linking with the application of e-business in the real business world.

Expertise Item	Courses
Analys and undertanding the data	- Corporate Financial management
	- Risk management
	- Feasibility Study
	- Financial Report Analysis
	- Tax
	- Stock Market
	- Business Research
	- Business Statistic
	- Business Math
	- Economic
	- Operational Research
	- Cost management
	- Accounting Management
	- Stock Market
Utilizing Big Data Information	- Supply Chain Management
	- Operational Research
	- Business Statistic
	- Marketing Management
Understanding the market conditions through data	- Feasibility Study
	- Operational Research
	- Business Statistic
	- Enterpreneurship
	- Marketing Management
Understanding the Customers through data	- Supply Chain Management
	- Enterpreneurship
	- Marketing Management
Control and build online reputation	- Supply Chain Management
	- Management Information System
Cost savings through data management	- Corporate Financial management
	- Cost Management

From the Table 2, it can be seen that the skills which are grouped into literacy technology, can also be accommodated into the courses. They are generally being taught at universities in Indonesia. However, there are some courses that not being taught such as Business Development, Technopreneur, E-Business and integrative Business Practice. The observation which done in South Sulawesi shows that these courses are only taught by universities with

entrepreneurship characteristic only. This research proves that in the industrial 4.0 era, the technological skills need to be taught in universities and also being supported with other business infrastructures by the government.

Expertise Item	Courses
Ability to use technology	- Information technology introduction
	- Management Information System
	- e-Business
	- Business Computer application
	- Technopreneur
Ability to manage technology	- Information technology introduction
	- Management Information System
Ability to understand and access technology	- e-Business
	- Business Computer application
	- Technopreneur
Understand how the machine works	- Total Quality management
	- Production and Operation Management
Understanding technology applications	- Integrative Business Practice
	- Management Information System
	- e-Business
	- Technopreneur
Increased production through the use of technology	- Business Development
	- Production and Operation Management
	- Total Quality Management
Quality improvement and quality control through technology	- Total quality Management
	- Business Computer Application

Expertise Mapping in the Field of Human Literacy

Human literacy skills as shown in Table 3 below, stated 8 skills that will be taught through 19 courses these courses have a core of teaching that focused on human ability both materially and spiritually which is expected to be in line with the statement of Haryono, (2018) which states that in human literacy students are expected to be able to mastering new literacy, namely:

1. Leadership skills and work skills in the teamwork.
2. Mature in agility and culture (cultural agility). Both are very important because they talk about the attitude of tolerance and understanding, also to appreciate others who have diversity in backgrounds but keep cooperative.

3. Entrepreneurship, it is the ability to create and to improve business, also to develop themselves for something valuable in financial in the future.

Expertise Item	Courses
Leadership, Team Cooperation, Cultural Maturity	- Self Development
	- Leadership
	- Five Principles and Citizenship
	- Language
Entrepreneurship	- Entrepreneurship
	- Law and Business Ethic
	- Business Communication and negotiation
	- Business Development
	- Integrative Business Practice
Extravenuous, agreeableness, conscientiousness, emotional stability openness to experience	- Self Development
	- Leadership
	- Five Principles and Citizenship
	- Language
Emotional intelligence	- Religion
	- Self Development
	- Leadership
Spiritual Intelligence (self-awareness, emotional management, self-motivation, empathy, managing relationship, communication skills (personal style).	- Religion
	- Self Development
	- Leadership
	- Organizational behavior
Tangible resource (financial, physical, technological and organizational).	- Language
	- Business Introduction
	- Management Itroudction
	- Accounting Introduction
intangible resource (human, innovation, creativity, and reputation)	- Organizational behavior
	- Design Thingking and Innovation
	- Integratif Business Practice
organizational capabilities, (outstanding customer service, excellent product development capabilities, innovation of product and services and ability to hire, motivate and retain human capital).	- Human Resourcess Management
	- Design Thinkig and Innovation
	- Total Quality management
	- Marketing management
	- Corporate Strategic magement
	- Law and Business ethic

The research in China says that the industry framework must keep on human intelligence. This study discusses how the manufacturing companies can emphasize the use of human intelligence and human resources fully in the process of adopting modern manufacturing and computer technology, (Yuejin, 2000) . Even in era 4.0, human intelligence cannot be eliminated at all. Therefore, human literacy must be covered in university curriculum in Indonesia.

Supporting Learning with Apprentice Program

Learning efforts in anticipating the industrial revolution 4.0, it is done by combining classroom learning to field practice learning (Table 4). Therefore, the students can quickly adapt to the progress. They will get used to be creative to the ways of thinking and to be innovative from field learning experience that keeps moving rapidly. The apprentice pattern program by Bina Nusantara University with one-year experience system is a good example of integrating the classroom and the field learning. It aims to provide real experiences for increasing students' ability toward the massive changes in Industrial Revolution 4.0.

Apprentice Program	Activities
Marketing expertise	Internship 1
Production expertise	Internship 2
Operational/Managerial expertise	Internship 3

The results of the Focus Group Discussion (FGD) which implemented by Bina Nusantara University concludes that to support entrepreneurship learning, it requires three important apprentice program forms, namely:

1. **Marketing Expertise:** Marketing is today, has experienced very rapid dynamics and very massive in technology used, the rise of e-business applications and the development of on-line marketing, is one of the dynamics that must be followed by adaptive learning.
2. **Expertise in Production:** The students need to have good skill on innovative and creative production, both in terms of content and packaging. Therefore, the apprentice program that students do in production houses, will further enhance their ability.
3. **Expertise in Operational/Managerial:** The good skill will help students to improve their ability in the managerial operational activities. The Government of South Sulawesi Province has established an apprentice network program by involving the academics, the industry and the Government to realize the student's capabilities and professionalism to face the industrial revolution 4.0.

The Curriculum Structure

The results of Focus Group Discussion (FGD) resulted in the composition of entrepreneurship learning courses consisting of 40 courses and 3 stages of apprenticeship with courses distribution as shown at Table 5. The curriculum structure mark on 3 groups, the blue box is signed for the subject in human literacy group, the yellow box is for data literacy groups and the red box is for a course in technology literacy groups.

The lecture is conducted in stages starting from the first semester to the seventh semester where the first semester will be the foundation for giving courses in the next semester. So, the lectures will be integrated between the first and the next semester.

That is all the description of universities in Indonesia in preparing their graduates to face the challenges and to make opportunity in industrial revolution 4.0. The University in Indonesia must be able to prepare both structures and infrastructure in the industrial 4.0 era by having support from the government and industry to improve the competition for Indonesian people in the Human Resource field.

Table 5
CURRICULUM STRUCTURE

SMT	COURSES								
VII			Integrative Business Practice	Proposal Seminar	Research Result Seminar	Thesis	Internship 3	Competence Test	
VI		Corporate Strategic Management	Business Development	Tax		Business Research	Elective Courses 3	Elective Courses 4	
V	Internship 2		Feasibility Study and Business Planing	Operational Research	Risk Management	Business Budgeting	Elective Courses 2	Elective Courses 1	Stock Market
IV	Leadership	Business Communication and Negotiation	Technopreneur	E-Bisnis	Supply Chain Management	Corporate Financial Management	Organizational Behavior		Financial Report Analysis
III	Human Resources Management	Production and Operation Management	Internship 1	Business Computer Application	Total Quality Management	Management Information System		English Business III	Accounting Management
II	Self Development	Law and Business Ethic	Entrepreneurship	Introduction to Information and Technologi	Business Statistic	Economics	Marketing Management	English Business II	Cost Management
I	Religion	Five Principals and Citizenship	Business Introduction	Management Introduction	Business Math	Indonesian Language	Design Thinking and Innovation	English Business I	Accounting Introduction

CONCLUSION

The results of this study indicate that universities need to anticipate the revival of the industrial revolution 4.0, especially by reforming teaching materials and procedures as well as

reforming structures and infrastructure, including the preparation of teaching staff who are also adaptive to the demands of change

Then this study will be an important reference to write good curriculum and to prepare learning strategies that directly to balance the portion of giving theory and doing practice in the field. In writing curriculum, this research may become good recommendation for integrative curriculum by arranging courses patterns, the courses in the first semester will be the compulsory thought for giving courses in the next semester, so that students have a strong scientific foundation in mastering their subjects to learn.

The findings of this study will be easily applied by higher education, considering to the certain regions in Indonesia such as in South Sulawesi, a network of apprentice program, has been formed by involving the Government, the Entrepreneurs and the Community.

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