Data Collection Survey for Kosen in Mongolia

Final Report

May 2017

Japan International Cooperation Agency (JICA)

Registered Non-Profit Organization Asia SEED

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List of Abbreviations

ADB	Asian Development Bank
BPO	Business Process Outsourcing
CDMA	Code Division Multiple Access
CE	Consultant/Chief Engineer
CHP	Combined Heat and Power
DAAD	Deutsche Akademische Austauschdiens (German Academic Exchange Service)
ERP	Enterprise Resource Planning
EV-DO	Evolution Data Only
FOB	Free On Board
GDP	Gross Domestic Product
GIZ	German Agency for International Cooperation
GMIT	German-Mongolian Institute for Resources and Technology
GNI	Gross National Income
GOSWS	General Office of Social Welfare Services
GSM	Global System for Mobile Communications
HEI	Higher Education Institute
HDI	Human Development Index
HSDPA	High-Speed Downlink Packet Access
HSPA	High Speed Packet Access
ICT	Information and Communication Technology
ILO	International Labor Organization
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupation
IMF	International Monetary Fund
IT	Information Technology
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JSC	Joint Stock Company
LLC	Limited Liability Company
KOICA	Korea International Cooperation Agency
MECSS	Ministry of Education, Culture, Science and Sports
M&E	Monitoring and Evaluation
MDGs	Millennium Development Goals
MLSP	Ministry of Labor and Social Protection
MNT	Mongolian Tugrik
MOF	Ministry of Finance

MOSA	Mongolian Software Industry Association
MPDSP	Ministry of Population Development and Social Protection
MUST	Mongolian University of Science and Technology
NDA	National Development Agency
NDC	Notional Defined Contribution
NEANET	NPO Northeast Asia Transportation Corridor Promotion Network
NGN	Next Generation Network
NGO	Non-governmental Organization
OFF-JT	Off-the-Job Training
OJT	On-the-Job Training
PE	Professional Engineer
PPP	Public Private Partnership
SGS	Société Générale de Surveillance
SIGO	Social Insurance General Office
SIO	Social Insurance Office
SOE	State Owned Enterprise
TVET	Technical Vocational Education and Training
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
WB	World Bank

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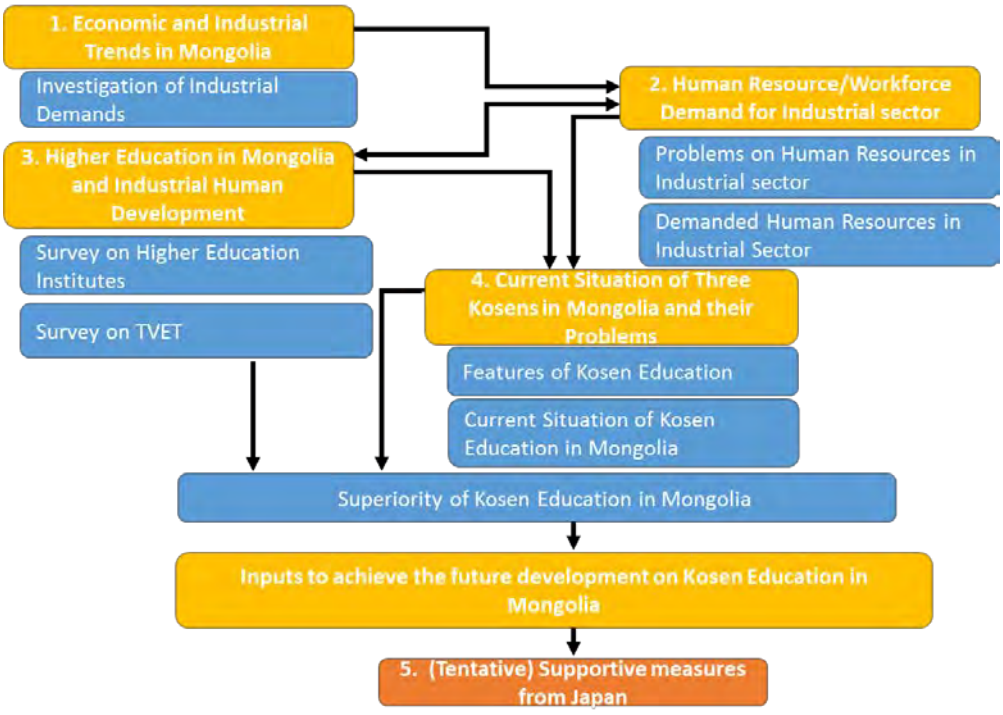
Summary of the Survey

Overall of This Report

This report consists of five chapters with the relation among the chapters shown the figure below. In Chapter 1 – Economic and Industrial Trends in Mongolia – we analyzed human-resource demands from industrial areas through a macroeconomic study of economic trends and industrial structure. In Chapter 2 – Study and Analysis on Human Resource/Workforce Demand for Industrial Sector in Mongolia – we surveyed human resource demands from a point of view in functions of jobs utilizing some results garnered face-to-face interview sessions with about 30 Mongolian companies. Chapter 3 – Outline of Higher Education in Mongolia and Industrial Human Development – shows the current system and situation of higher education in Mongolia and then legislative progress in implementation of Kosen education in Mongolia. Moreover, we suggest an advantageous position which Kosen education should play comparing it with current systems of other higher educational institutions (universities) in Mongolia or higher education in other countries producing human resources. In Chapter 4 we outline current situation of Kosen Technical Colleges that have already been established in Mongolia and discuss their problems. Chapter 5 delineates what we should work on to develop Kosen education effectively in Mongolian educational system and propose several supportive measures which Japan is expected to carry out for the development.



Structure of Chapters of this Report

Chapter 1 －Economic and Industrial Trends in Mongolia

One of the most prominent features of Mongolian economy is its heavy dependence on the mining sector, which forms 16.7 percent of GDP, 78.8 percent of export and 64.1 percent of foreign investment respectively; Mongolian economic growth rate in 2015 plunged into 2.5 percent and the expectation rate in 2016 is 0 percent due to continuing low prices of mineral resources, an economic slowdown in China and sluggishness of foreign investment in these several years. Toward sustainable economic growth in Mongolia, the Government of Mongolia has formulated the `Mongolia Sustainable Development Vision – 2030` that aims diversified and high value-added industries, ecological balance and democratic governance. In order to achieve this vision, it is necessary to expand crop-livestock production utilizing natural resources as well as to develop manufacturers that will add high value to domestically produced raw materials (especially, food processing, textiles, leather, construction materials, mineral processing, etc.), energy and infrastructure, ICT industry, and so on. In addition, rearing professional engineers who will contribute to technological innovation of such industries is required. Meanwhile, a forecast of the medium to long-term labor supply and demand conducted by the Mongolian Institute for Labor Studies predicts that there will be high growth rate of employment in engineering areas, especially, advanced science and technology, mining, ICT, transportation and manufacturing industries.

Chapter 2－Study and Analysis on Human Resource/Workforce Demand for Industrial Sector in Mongolia

The following table is a summary of human resource/workforce demand for industrial sector in Mongolia found through above-mentioned face-to-face interview sessions.

viewpoints	outlines	remarks
Work of engineers	・ Research and development, product development, quality and process control, hygiene and safety management and supervision of technicians ・ Especially, problem finding and solving to improve productivity of each manufacturing process	Technician's main tasks are machine operation and maintenance, various skilled jobs.
Ability gaps	・ University graduates in engineering line learn theories to some extent but do not have enough practical skills (problem analyzing, problem solving) due to lack of experience in operation of latest type of machines. ・ TVET/technical college graduates have practical skills to some extent but are weak at theory. They are not immediate asset to companies because being trained using old machines in their school years. Their motivation for work is low.	Communication skill, teamwork and self-enlightenment are not cultivated among graduates from universities as well as from TVET/Technical College.
Future demands for development of human resources	・ Practical engineers who have knowledge and operational experience on latest type of machines and contribute to quality development of products and creation of new products exerting originality and ingenuity. ・ Ability of problem solving through analysis of data and problems in process management and quality control.	

Expectation for higher education	・ Practical education realized through development of curriculum and teaching materials (educational equipment) in corresponding to global standards for each industrial area. ・ Development of ability of problem analysis, problem solving and communication-teamwork skills through group works ・ Bolstering application of technology through buildup of business-academia collaboration	

Generally speaking, it is demanded to bring up people equipped with ability of problem analysis and solving who go through well-balanced study of latest theory and experience of laboratory work using newest machine by group work.

Chapter 3－Outline of Higher Education in Mongolia and Industrial Human Development

The number of students in Higher Educational Institutes has been increased based on the needs of higher education since 2000: the number of students in the academic year 2015-2016 increased to about 65% from the academic year 2002-2003. The proportion of the students who have entered universities to all graduates from full-time senior high schools in the academic year 2016-2017 was 75.6 percent; the proportions of the students who have chosen science or engineering majors were about 5 percent or 16.3 percent respectively, which shows just a small increase compared with data in 2012.

On the other hand, there can be found a gap between type of human resources demanded by companies in industrial area (to be shown in Chapter 2) and the graduates educated by Mongolian existing Higher Education Institutes. This is due to the situation such that current educational programs focus on theoretical learning mainly through lectures and most students start working without adequate ability of application or problem solving which are supposed to be fostered through experiment or laboratory work.

It is urgent necessity to educate practical engineers equipped with such kind of knowledge and skills essential to fulfill the demands from companies in industrial area in the context of trend looking toward near-future diversification of Mongolian industries as stated in Chapter 2, which existing universities or TVETs are not able to foster: we may conclude that Mongolia needs educational institutes which can produce this type of engineers.

Chapter 4－Current Situation of Existing Kosen Technical Colleges in Mongolia and their Problems

At present, there are three Kosen Technical Colleges in Mongolia – ‘College of Technology, Institute of Engineering and Technology’, ‘Institute of Technology, Mongolian University of Science and Technology’ and ‘New Mongol College of Technology’ – being modeled after Japanese Kosen Technical Colleges based on its curriculums. Although the Kosen Technical Colleges in Mongolia have already started educational activities, their educational environment is still not well-prepared: the following are needed.

- qualitative and quantitative increment of teaching staffs
- improvement of educational environment such as teaching materials, educational apparatus and equipment

Chapter 5－Framework of the New Mongolian Kosen Education System

While we show current situation and problems of the existing Kosen Technical Colleges and clarify main challenges to develop Kosen education, besides these problems which can be recognized directly among the colleges. In addition to these factors which can be recognized directly among higher education institutes, the following measures are important to promote Kosen education in Mongolia.

a）to promote profound awareness of Kosen education system in Mongolia

b）to give suitable priority to engineering fields that accommodate the needs of industrial human resources

c）to advance education level of the existing three Kosen Technical Colleges

d）to illustrate policy and strategy for development of Kosen education in Mongolia

Chapter 1. Economic and Industrial Trends in Mongolia

Mongolia has experienced slow growth since 2015 due to weakened commodity prices, the slowdown in China's economy, and a decline in foreign investment. To achieve sustainable economic growth through structural transformations, the Government of Mongolia has formulated the "Mongolia Sustainable Development Vision – 2030", (referred to as "Vision 2030" hereinafter), that works towards diversified and high value-added industries, ecological balance, and democratic governance.

To achieve this vision, there is a high demand to expand crop-livestock production which utilizes natural resources. Meanwhile, there is a high demand to develop energy and infrastructure, ICT industry, and high value-added manufacturing industries with raw materials which can be procured domestically, especially food processing, textiles, leather, construction materials, mineral processing, etc. In addition, the cultivation of professional engineers that can contribute to the technological innovation of such industries is required.

1.1 Outline of Mongolian Economy and Industry

1.1.1 Trends in Economic and Industrial Structure

(1) Macroeconomic Trends

1) GDP Growth Rate and Forecast

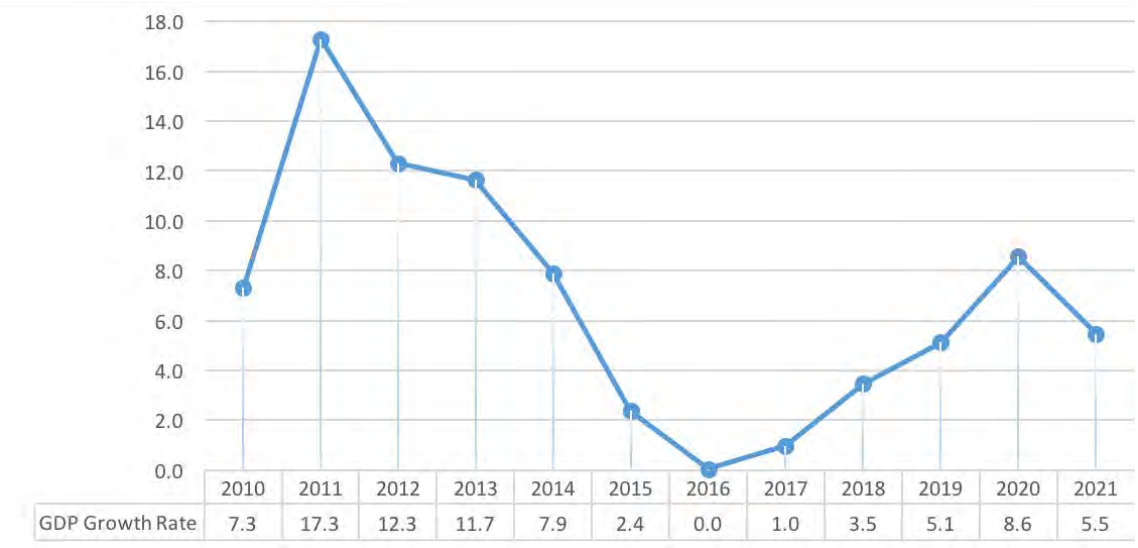
Figure. 1-1 outlines the GDP growth rate from 2010 to 2016 and the economic forecasts from 2017 to 2021.

Over the five years from 2010 to 2014, Mongolia achieved 7% growth every year due to growth in mineral resources, which is the dominant industry in Mongolia, as well as favorable price of mineral resources on the international market. At the same time, Mongolia achieved an average annual GDP growth rate of 11.3% over the five years, and 17.3% in 2011 which was recorded as the world's highest GDP growth rate. Mongolia experienced an economic boom since the transitions in socio-economic system from socialist and centrally-planned economy to democratic and free market economy in the 1990's.

However, after that, Mongolia started to experience a cooling-off of its high rates of economic growth and the GDP growth rate plummeted to 2.4% in 2015. Furthermore, its economic growth forecast for 2016 is down to 0%. Much of that has been in the decline of mineral prices on the international market and the slowdown of the Chinese economy. The monoculture economy with high dependence on mineral resources and the excessive trade dependence on neighboring China have become challenging.

Regarding GDP growth forecast from 2017 to 2021, it predicts that the growth will remain as low as 1.0% in 2017 and 3.5% in 2018. However, GDP growth rate is expected to exceed 5% in the subsequent three years from 2019 to 2021. The main factors that lead to economic growth are expected to be as follows: 1) the increase in FDI accelerated by the progress of mining development including the underground development of the Oyu Tolgoi mine, 2) the issue of refinancing bonds of government foreign currency denominated bonds with support from international organizations such as IMF, World Bank, ADB and from

countries such as Japan, China, Korea, etc., which allows existing debt to be redeemed, and 3) the recovery of mineral prices such as copper and coal which have declined since 2011.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
GDP Growth Rate	7.3	17.3	12.3	11.7	7.9	2.4	0.0	1.0	3.5	5.1	8.6	5.5

(Source: Based on IMF)

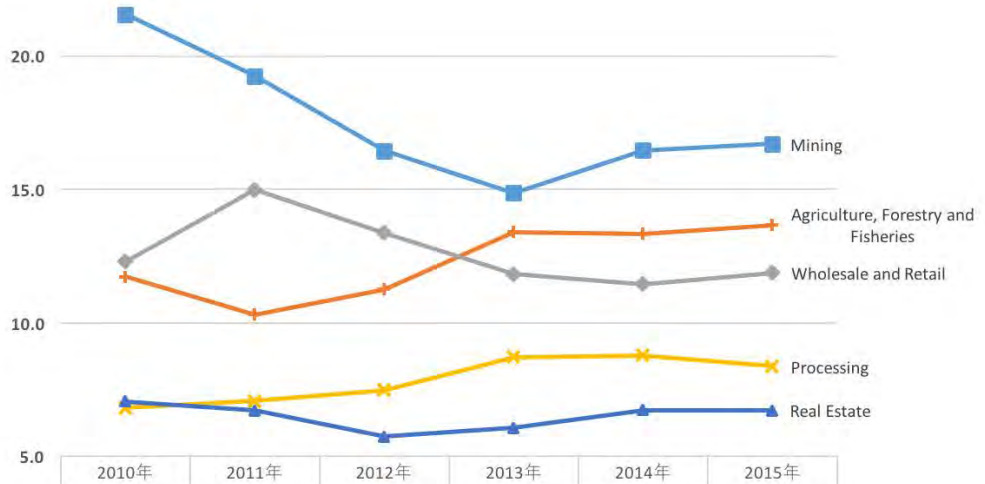
Figure. 1-1 Economic Growth Rate and Forecast 2010~2021

2) Changes in GDP Sector Composition

Figure. 1-2 outlines the changes in GDP composition by 5 major industries. As of 2015, five major components of GDP were in order of the following: agriculture, forestry and fishery, retail and wholesale, processing industry, real estate industry.

It is obvious that the mining industry is the largest component of GDP since 2010 and it is the dominant driving force behind the economy. However, compared to the composition ratio of 21.6% as of 2010, it was 16.7% as of 2015, which decreased by 5%. Compared to the second largest component of GDP each year, difference has been reduced from about 10% to about 3%.

The agriculture, forestry and fisheries industry remains the second largest component of GDP for the third consecutive year since 2013. It surpassed the retail and wholesale industry in 2013, which was the second largest component until 2012. The agriculture, forestry and fisheries industry is the industry with high potential in Mongolia, which is well known for its nomadic traditions and extensive land area.



	2010年	2011年	2012年	2013年	2014年	2015年
Mining	21.6	19.3	16.4	14.9	16.5	16.7
Agriculture, Forestry and Fisheries	11.7	10.3	11.3	13.4	13.3	13.7
Wholesale and Retail	12.3	15.0	13.4	11.8	11.5	11.9
Processing	6.8	7.1	7.5	8.7	8.8	8.4
Real Estate	7.1	6.7	5.7	6.1	6.7	6.7

（Source: Based on National Statistics Office of Mongolia）

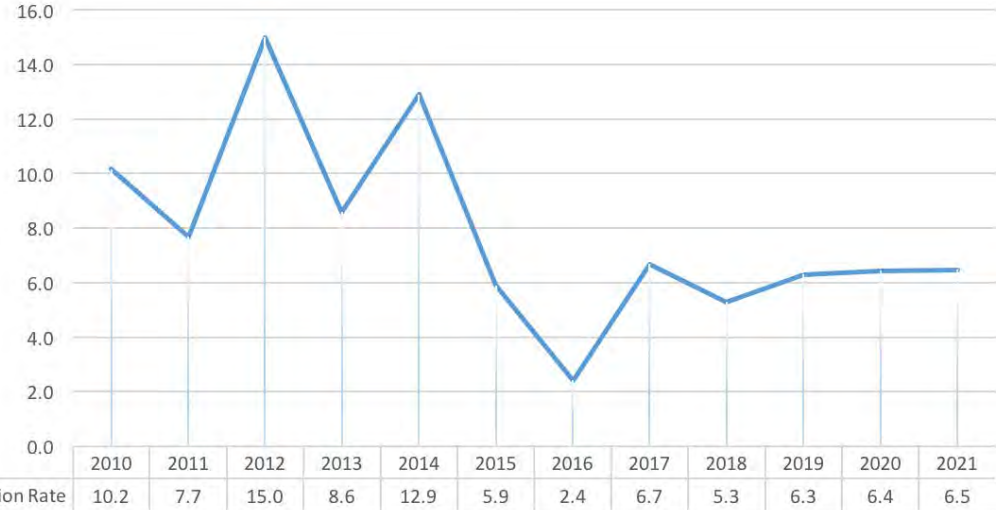
Figure. 1-2 Changes in GDP Composition Ratio, Breakdown by 5 Major Industry 2010~2015

3) Inflation Rate and Forecast

Figure. 1-3 outlines the changes in inflation rate and its prospects.

Over the five years from 2010 through 2014, it recorded a very high inflation rate of 10.9% on average, but then it plummeted to 5.9% in 2015 and 2.4% in 2016, correlating with GDP growth rate.

From 2017 onwards, the inflation rate is expected to be in the range of 5% to 6% according to its central bank, which is expected to be stable compared to previous period. Meanwhile, inflation target in 2017 is under 7%.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Inflation Rate	10.2	7.7	15.0	8.6	12.9	5.9	2.4	6.7	5.3	6.3	6.4	6.5

（Source : Source: Based on IMF）

Figure. 1-3 Inflation Rate and Forecast 2010~2021

(2) Import and Export Trends

1) Changes in Imports and Exports

Figure. 1-4 outlines the trends of imports and exports.

Looking at the latest trends, both imports and exports are decreasing. Imports decreased by USD 2.9 billion compared to 2012 when it reached an all-time high. Meanwhile exports decreased USD 1.1 billion compared to 2014.

Regarding the trade balance, as of 2010, the trade deficit of approximately USD 300 million expanded to an average of approximately USD 2.1 billion over the three years from 2011 to 2013. Thereafter, from 2014 to 2015, it turned to a trade surplus of USD 600 million and USD 900 million respectively, due to a significant decrease in imports.

	2010	2011	2012	2013	2014	2015
Import	3.2	6.6	6.7	6.4	5.2	3.8
Export	2.9	4.8	4.4	4.3	5.8	4.7

(Source: Based on National Statistics Office of Mongolia)

Figure. 1-4 Import and Export Trends 2010~2015

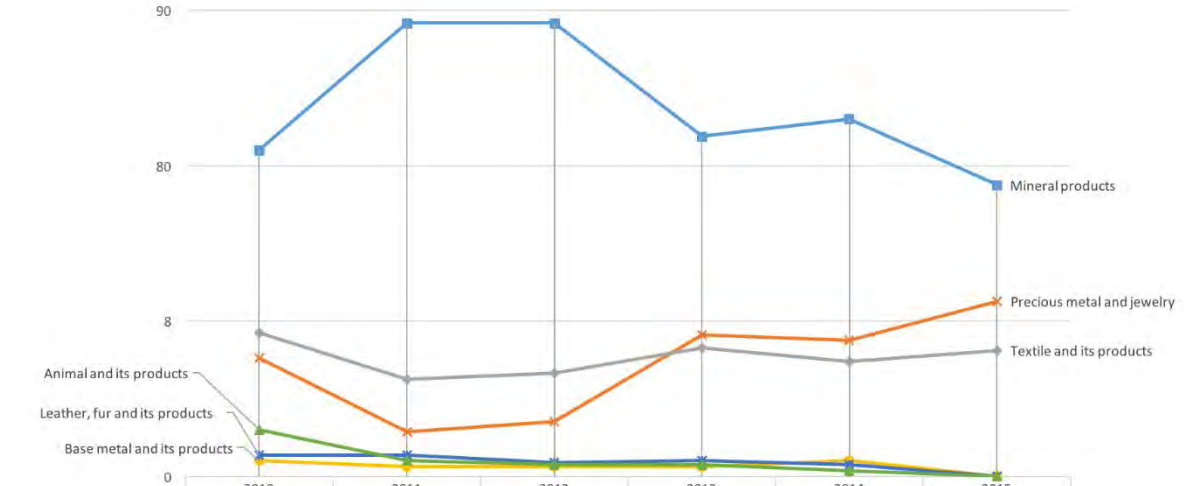
2) Composition of Exports

Figure. 1-5 and Table 1-1 outline the changes in composition of main exports by ratio and by value.

Generally, exports of mineral products remain highly concentrated, whereas its downturn is prominent in the latest trend. From 2010 to 2015, mineral products remained the country's top export for six years, and the proportion by 2014 was more than 80%. Between 2011 and 2012, it reached 90% of the total. On the other hand, it decreased drastically from 2013 to 2015, and the proportion in 2015 was 78.8%, which decreased by 10.4% compared in 2011 and 2012.

The second largest export value belongs to precious metal and jewelry which was the third in the past, surpassed textile and its products in 2013.

From the fourth to the sixth largest export value are in order of the following: base metal and its products, leather, fur and its products, animal and its products. However, as of 2015, the combined shares of these products accounted for less than 1% of total exports.



	2010	2011	2012	2013	2014	2015
Mineral products	81.0	89.2	89.2	81.9	83.0	78.8
Precious metal and jewelry	6.1	2.3	2.8	7.3	7.0	9.0
Textile and its products	7.4	5.0	5.3	6.6	5.9	6.5
Base metal and its products	0.8	0.5	0.5	0.5	0.8	0.0
Leather, fur and its products	1.1	1.1	0.7	0.8	0.6	0.0
Animal and its products	2.4	0.8	0.6	0.6	0.3	0.0

(Source: Based on National Statistics Office of Mongolia[1])

Figure. 1-5 Composition of Exports by Ratio 2010~2015

Furthermore, a positive correlation between the exports of mineral products and total exports is as shown in Table 1-1. From 2010 to 2015, the exports surged in 2011 and slightly decreased until 2013, but it surged again in 2014 and decreased in 2015.

Table. 1-1 Composition of Exports by Value 2010~2015

	2010	2011	2012	2013	2014	2015
Mineral Products	2355.9	4297.2	3911.2	3496.4	4792.7	3678.4
Precious Metal and Jewelry	177.4	110.8	122.8	311.6	404.2	421.4
Textile and its Products	215.2	240.9	232.4	281.8	340.7	302.7
Base Metal and its Products	23.3	24.1	21.9	21.3	46.2	0.0
Leather, Fur and its Products	32.0	53.0	30.7	34.2	34.6	0.0
Animal and its Products	69.8	38.5	26.3	25.6	17.3	0.0
Others	34.9	53	39.5	98.2	138.6	267.1
Total	2908.5	4817.5	4384.8	4269.1	5774.3	4669.6

(Source: Based on National Statistics Office of Mongolia)

3) Composition of Imports

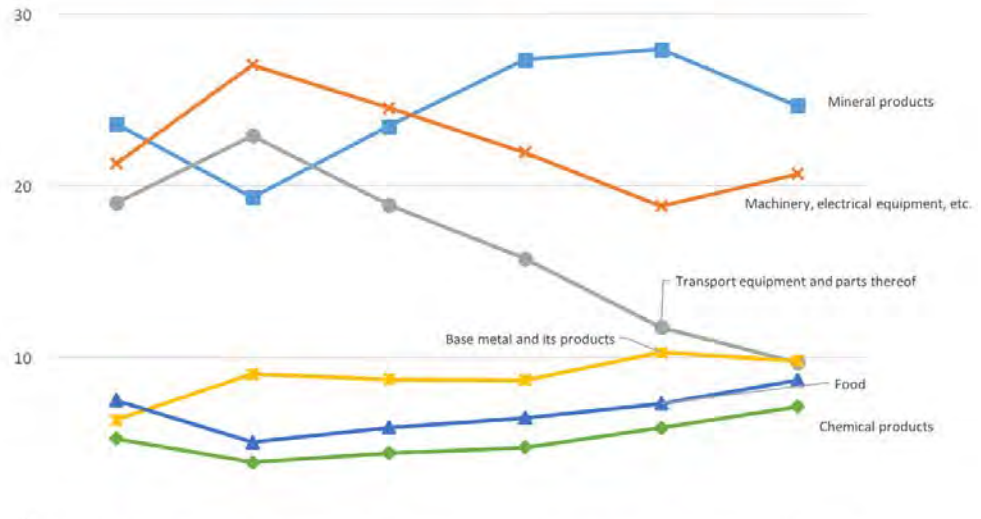
Figure. 1-6 and Table 1-2 outline the changes of main imports.

According to Table 1-2, major imports have been in a slump. The value of all top five imports has decreased since 2013.

In particular, imports of mineral products, which are the largest imports, have decreased drastically since 2013. The imports dropped to 940 million US dollars in 2015 with a reduction of USD 800 million compared to USD 1.75 billion dollars in 2013. Meanwhile, the difference between mineral products and

[1] Data as of 2015 is not included, and it is assumed to be 0% for the sake of convenience.

machinery, electrical equipment, which are the second largest imports, was 9.2 points in 2014 and reduced to 4.0 points in 2015.



	2010	2011	2012	2013	2014	2015
Mineral products	23.6	19.3	23.5	27.3	28.0	24.7
Machinery, electrical equipment, etc.	21.3	27.0	24.5	21.9	18.8	20.7
Transport equipment and parts thereof	19.0	22.9	18.9	15.7	11.8	9.7
Base metal and its products	6.3	9.0	8.7	8.7	10.3	9.8
Food	7.5	5.0	5.9	6.5	7.3	8.7
Chemical products	5.3	3.9	4.4	4.8	5.9	7.1

(Source: Based on National Statistics Office of Mongolia)

Figure. 1-6 Composition of Imports by Ratio 2010~2015

Table. 1-2Composition of Imports by Value 2010~2015

	2010	2011	2012	2013	2014	2015
Mineral Products	754.9	1274.4	1581.2	1738.6	1463.9	936.4
Machinery, Electrical Equipment, etc.	681.3	1783.9	1653.0	1395.4	984.7	785.5
Transport Equipment and Parts Thereof	607.6	1512.9	1272.1	1000.7	615.8	368.1
Base Metal and its Products	203.1	594.5	588.0	551.6	538.8	372.0
Food	239.7	332.8	397.6	412.0	382.6	329.5
Chemical products	168.2	255.4	298	302	308.9	270.3
Others	545.2	844.5	948.5	957.5	942.0	735.4
Total	3200.0	6598.4	6738.4	6357.8	5236.7	3797.2

(Source: Based on National Statistics Office of Mongolia)

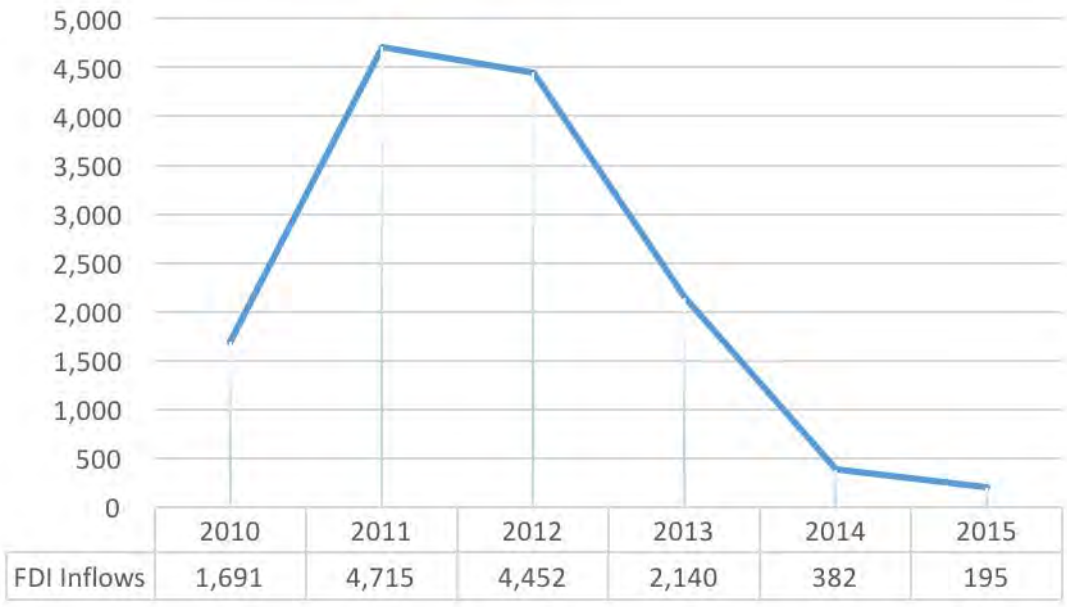
(3) Investment Trends including Trends in Market Penetration of Japanese Companies

1) Trends in Foreign Investment

As shown in Figure. 1-7, FDI inflows have dropped dramatically since 2013.

Over the six years from 2010 to 2015, FDI inflows were most volatile. Inflows increased 2.8 times from USD 1.69 billion to USD 4.72 billion between 2010 to 2011. However, inflows decreased drastically to USD 2.14 billion in 2013, followed by USD 380 million in 2014 and USD 200 million in 2015. Productivity Stagnation of highly concentrated mineral products and reconsideration of foreign investment led to a worsening investment environment.

Regarding future trends, they are likely to be affected by trends in mining sector and improvement of investment environment.



	2010	2011	2012	2013	2014	2015
FDI Inflows	1,691	4,715	4,452	2,140	382	195

(Source: Based on UNCTAD)

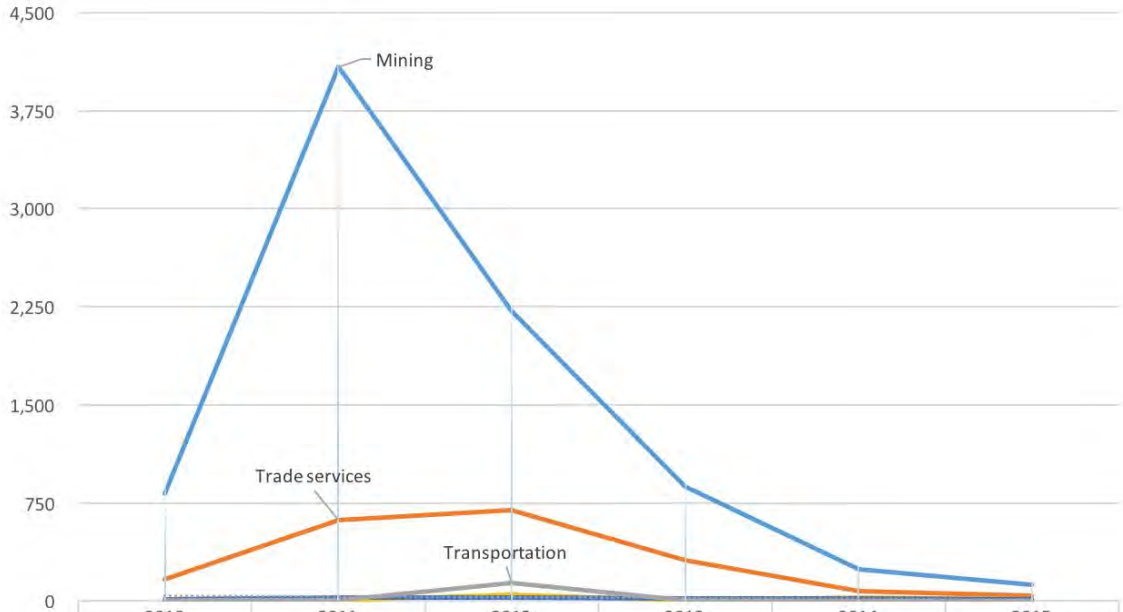
Figure. 1-7 Trends in FDI Inflows 2010~2015

2) Breakdown of Foreign Investment by Sector and Country

As mentioned earlier, the mining sector has been consistently ranked as the first investment in the past six years.

Regarding the first ranked mining industry, it increased slightly from 2008 to 2010, and then increased rapidly in 2011, which recorded the world's highest economic growth rate. In 2011, the investment reached USD 4,088 million, which is 5.0 times faster than in 2010. However, since 2012 the investment has declined sharply, and in 2015 it decreased to less than 1/30 of its peak.

Other sectors are in order of the following: trade services, construction, finance, all of which decreased sharply in 2015.



	2010	2011	2012	2013	2014	2015
Mining	820	4,083	2,218	872	241	125
Trade services	163	621	694	309	73	39
Construction	1	5	48	3	23	10
Finance	13	24	28	18	19	10
Transportation	3	7	135	6	0	0
Others	26	246	76	11	27	12
Total	1,026	4,986	3,199	1,219	382	195

(Source: Based on National Statistics Office of Mongolia, Invest Mongolia Agency, Bank of Mongolia[2])

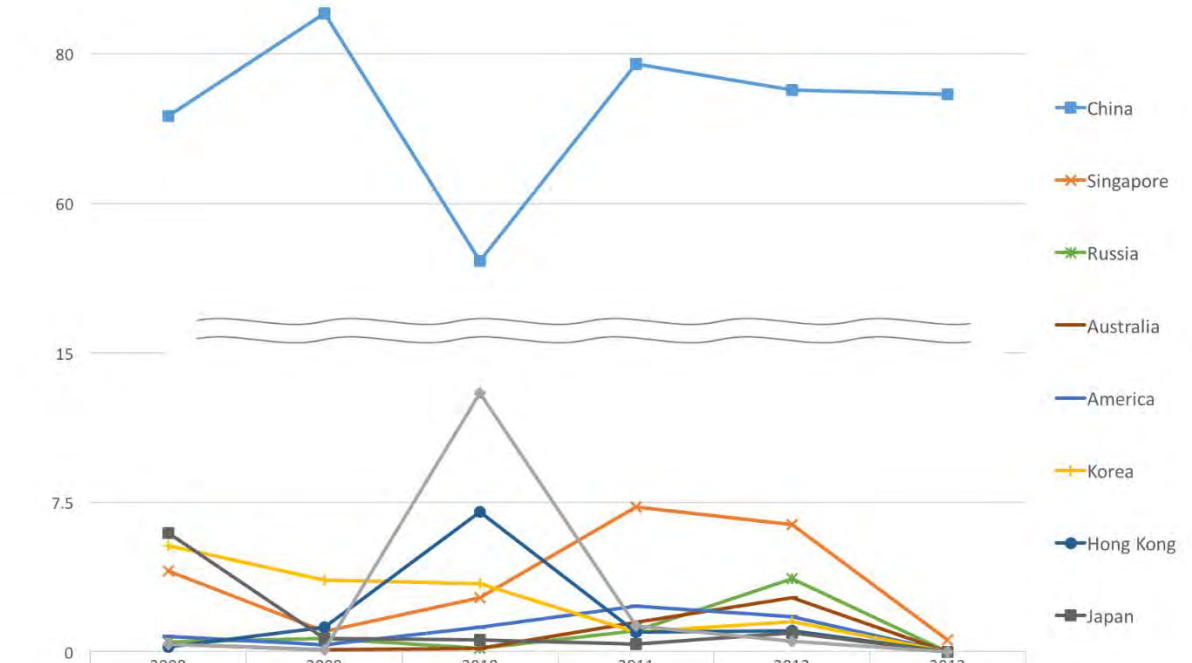
Figure. 1-8 FDI by Sector 2008~2015

As shown in Figure. 1-9 and Table 1-3, as the neighboring to Mongolia, China is the largest investor in Mongolia by shares and by value with a dominant presence compared to other countries. Regarding its composition ratio of total FDI, despite an increase in investment from Canada which resulted in a decline to 52.3% in 2010, it accounted for an average of 77.7% over the four years from 2008 to 2012. It is obvious that the China's presence in Mongolia economy is remarkable. However, investment from China has decreased sharply since 2012.

Regarding other countries and areas, Canada was the second largest investor and Hong Kong was the third largest investor in 2010. Both of them showed a temporary increase in investment amount and ratio in 2010 followed by a sharp decline from 2011 to 2012. In 2012, the second to fifth largest investor countries are in order of the following: Singapore, Russia, Australia and the United States. Singapore has dramatically increased its investment since 2011 and surpassed the third largest investor country thereafter.

Regarding Japan, it was the second largest investor country in 2008, but dropped to fifth place in 2009, seventh place in 2010, and ninth place in 2011, eight places in 2012.

[2] Netherlands, Luxembourg, British Virgin Islands, which are regarded as tax heaven, are included in the calculation regarding China. Data of each country except China and Singapore in 2013 are not included, and it is assumed to be 0% for the sake of convenience * Same in Figure 9 and Table 3



	2008	2009	2010	2011	2012	2013
China	71.7	85.4	52.3	78.6	75.1	74.7
Singapore	4.5	1.1	3.0	8.1	7.1	0.7
Russia	0.6	0.7	0.2	1.2	4.1	0.0
Australia	0.4	0.1	0.2	1.6	3.0	0.0
America	0.8	0.4	1.4	2.5	2.0	0.0
Korea	5.9	4.0	3.8	1.1	1.7	0.0
Hong Kong	0.3	1.4	7.8	1.1	1.2	0.0
Japan	6.6	0.7	0.7	0.4	1.1	0.0
Canada	0.4	0.1	14.4	1.4	0.6	0.0

(Source: Based on Ministry of Economic Development of Mongolia, Invest Mongolia Agency)

Figure. 1-9 Composition of FDI by Country 2008~2013

Table. 1-3Composition Amount of FDI by Country 2008~2013

	2008	2009	2010	2011	2012	2013
China	508	684	537	3,920	2,404	910
Singapore	32	9	31	403	227	8
Russia	4	6	2	58	130	-
Australia	3	1	2	82	96	-
The United States	6	3	14	127	63	-
Korea	42	32	39	55	54	-
Hong Kong	2	11	80	54	38	-
Japan	47	6	7	21	34	-
Canada	3	1	148	72	19	-
Others	62	48	167	193	134	301
Total	709	801	1,027	4,985	3,199	1,219

(Source: Based on Ministry of Economic Development of Mongolia, Invest Mongolia Agency)

3) Trends in FDI of Japan

From 2010 to 2015, investment from Japan to Mongolia temporarily decreased in 2013 and 2014, but has been generally on the rise.

	2010	2011	2012	2013	2014	2015
FDI from Japan	7.1	21.4	24.7	10.3	11.3	38.2

(Source: Invest Mongolia Agency, Bank of Mongolia)

Figure. 1-10 Trends in FDI of Japan 2010~2015

1.1.2 Trends in Population Structure and Labor Market

(1) Trends and Prospects of Population

Regarding the trends and prospects of the population from 2010 to 2021, as shown in Figure. 1-11, it is expanding rapidly with an increase in population from 30,000 to 50,000 every year.

The population of Mongolia was 2.97 million as of 2015, which ranked 132nd in the world.

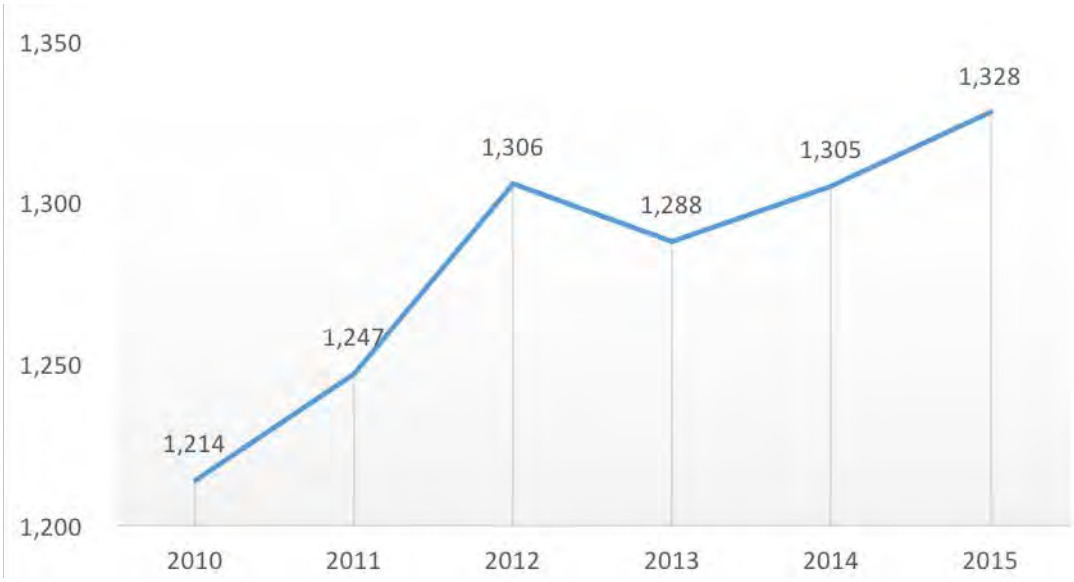
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Population	2.76	2.79	2.84	2.88	2.93	2.97	3.01	3.06	3.11	3.15	3.20	3.25

(Source: Based on IMF)

Figure. 1-11 Trends and Prospects of Population 2010~2021

(2) Trends in Labor Force

The labor force was on the rise as shown in the figure below from 2010 to 2015. The average increase was 22,800 over the five years, and the total increase was 114,000.



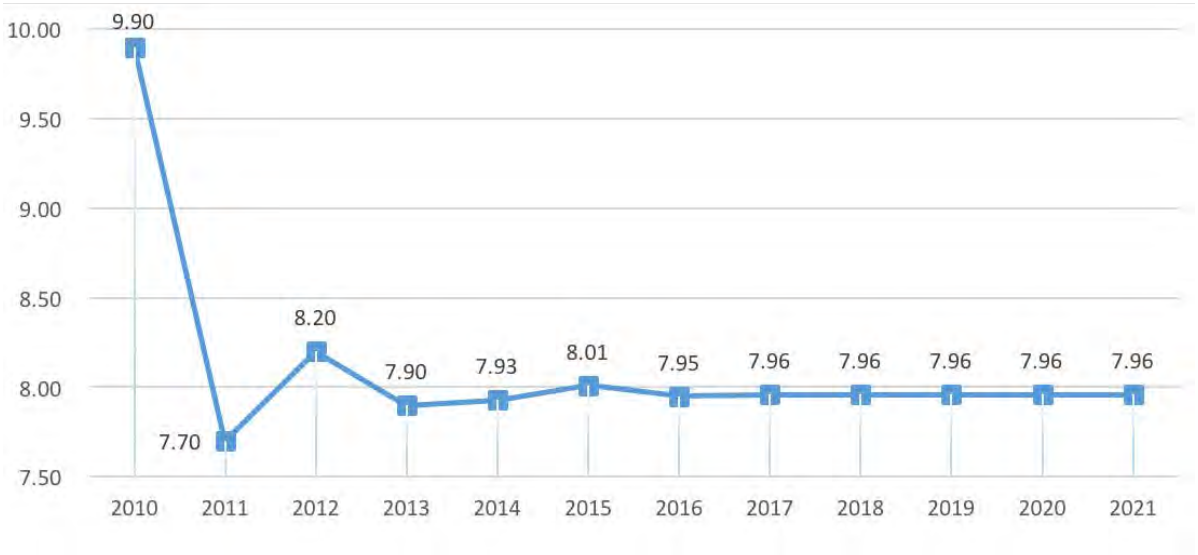
(Source: Based on ILO)

Figure. 1-12 Trends in Labor Force 2010~2015

(3) Unemployment Rate and Forecast

As shown in the figure below, the unemployment rate decreased to 7.7% in 2011 after reaching 9.9% in 2010 and increased slightly to approximately 8% thereafter.

According to IMF, it is expected that the unemployment rate will remain at the same level in the future through 2021.



(Source: Based on IMF)

Figure. 1-13 Unemployment Rate and Forecast 2010~2021

(4) Labor Supply and Demand by Industry

According to the mid-term and long-term labor supply and demand forecast conducted by the Mongolian Institute for Labor Studies[3] in 2014, employment in Mongolia will increase by 1.9% from 1.1 million to 1.32 million from 2013 to 2023. Among them, it is predicted that engineering talent, especially those with high employment growth rates, are in professional, scientific and technical activities, mining, ICT, transportation and warehousing industry, manufacturing industry. Meanwhile, the employment in wholesale, retail and automobile maintenance increased by 43,000 during the same period. In 2023, it is predicted to reach 200,000, following agriculture, forestry, fishery and livestock industry, becoming the second largest employment sector. On the other hand, it is predicted that the employment in agriculture, forestry, fishery and livestock industry will decrease by more than 110,000 in ten years.

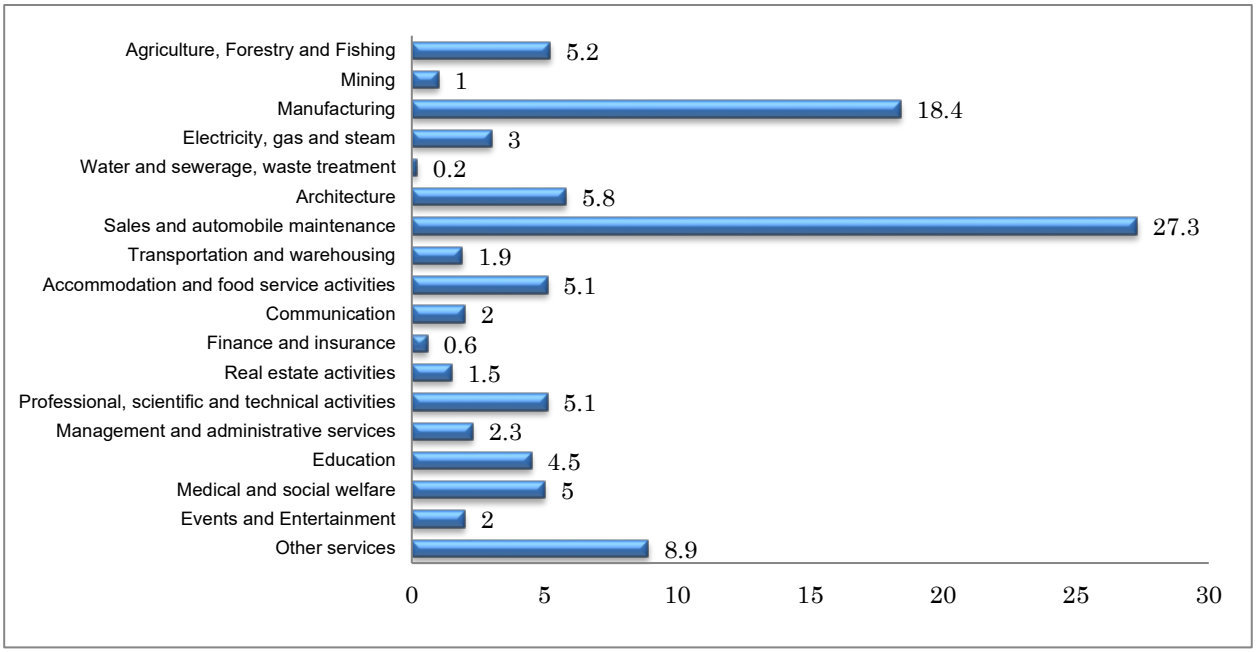
Table. 1-4Labor Supply and Demand by Industry 2013-2023

Industry Classification	2013	2023	Annual Growth Rate
Agriculture, Forestry, Fisheries and Livestock	329,100	212,984	-3.5%
Mining	50,300	83,147	6.5%
Manufacturing	81,000	123,857	5.3%
Electricity, Gas, Steam, Air Conditioning Supply	13,800	18,698	3.5%
Water and Sewerage, Waste Treatment	7,900	10,062	2.7%
Construction	72,400	98,269	3.6%
Wholesale, Retail and Automobile Maintenance	156,000	199,544	2.8%
Transportation and Warehousing	65,900	103,745	5.7%
Accommodation and Food Service Activities	31,700	46,725	4.7%
ICT	16,700	27,366	6.4%
Finance and Insurance	20,900	31,409	5.0%
Real Estate Activities	800	2,252	18.2%
Professional, Scientific and Technical Activities[4]	13,600	34,046	15.0%
Management and Administrative Services	15,000	23,986	6.0%
Public Administration, Defense and Social Security	65,300	79,734	2.2%
Education	89,800	109,795	2.2%
Medical and Social Welfare	40,400	60,259	4.9%
Arts and Entertainment	9,200	11,398	2.4%
Other Services Activities	20,200	39,936	9.8%
Total	**1,103,600**	**1,317,212**	**1.9%**

(Source: Medium to Long-term Forecast of Labor Supply and Demand, Institute for Labor Studies, 2014)

[3] Institute for Labour Studies was an institute under the Ministry of Labor. Now it becomes the Institute for Labour Studies and Social Welfare due to reorganization of ministries in 2016.
[4] Professional services linclude legal and accounting services, blueprint production. Scientific and technical activities include scientific research, experiment of applied technology and its analysis.

According to the labor demand barometer survey conducted by Institute for Labor Studies in 2015, sectors with notable labor shortage and big gap between labor supply and demand, are in order of the following: wholesale and vehicles repairing, manufacturing, and other service activities. According to the survey conducted in the previous year, the proportion of construction industry with a large labor shortage was decreasing. In manufacturing industry, the shortage in mechanic engineers and welding workers was increasing.



(Source: Survey on needs of human resource in industrial sector 2015, Institute for Labor Studies)

Figure. 1-14 Gap between Labor Supply and Demand by Industry

1.2 Priority Area in the National Plan

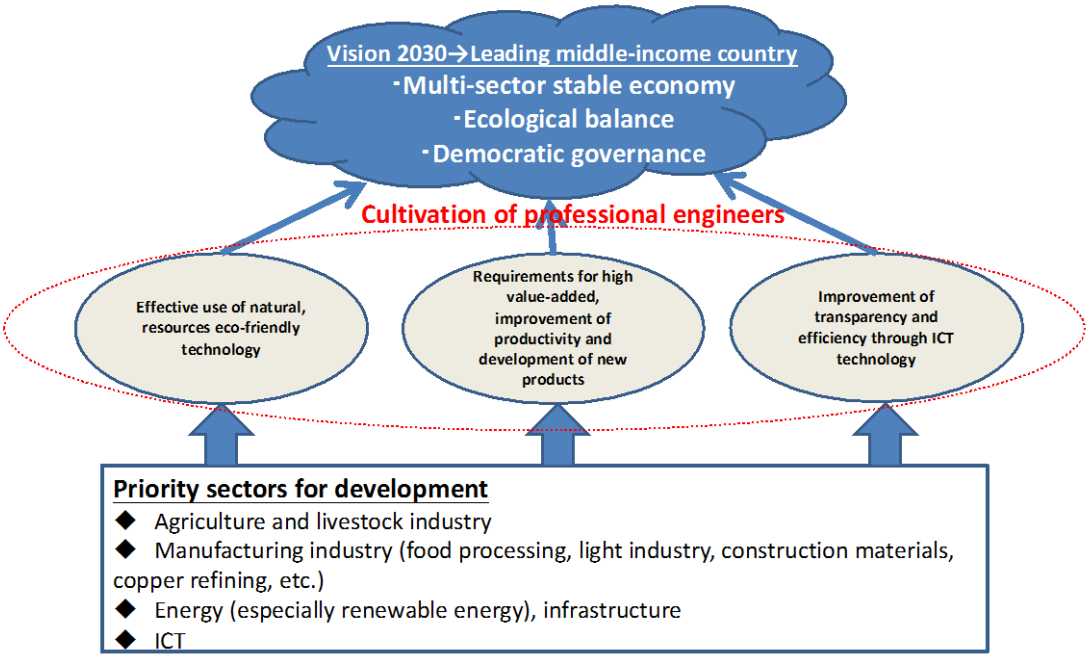
Mongolia has formulated the Vision 2030, which was approved by Parliament in February 2016. The Vision 2030 states: by 2030, Mongolia aspires to be amongst the leading middle-income countries based on per capita income. It hopes to be a multi-sector stable economy, and a society dominated by middle and upper-middle income classes, which would preserve ecological balance, and have stable and democratic governance

Further, the document states “Mongolia would achieve the following through implementation of the Vision 2030”:

1. Increase its GNI per capita to USD 17,500 and become an upper middle-income country based on its income per capita.
2. Ensure average annual economic growth of not less than 6.6 percent through 2016 -2030.
3. End poverty in all its forms.

4. Reduce income inequality and have 80 percent of the population in the middle and upper-middle income classes.
5. Increase the enrollment rate in primary and vocational education to 100 percent, and establish lifelong learning system.
6. Improve the living environment of the Mongolian people to lead a healthy and long life; Increase life expectancy at birth to 78 years.
7. Be placed among first 70 countries on the ranking of countries by the human development index.
8. Preserve ecological balance and to be placed among first 30 countries on the rankings of the countries by the green economy index in the world.
9. Be ranked among first 40 countries by the Doing Business index and among first 70 countries by the global Competitiveness index in the world.
10. Build professional, stable and participative governance, free of corruption that is adept at implementing development policies at all levels.

As mentioned above, Mongolia aims to diversify industries from industrial structure that is dependent on primary mineral products and to increase added value through technological innovation, as well as to develop eco-friendly technology and to establish democratic and transparent governance. In order to diversify industries and achieve such goals, it is necessary to make good use of natural resources and eco-friendly technologies that can maintain ecological balance, Also, it is necessary to modernize manufacturing industry where raw materials can be procured within Mongolia and to introduce innovative technologies to develop highly competitive new products. Meanwhile, there is a need to create a highly transparent investment environment through further utilization of ICT technology and to improve efficiency and productivity. To that end, there is a high demand to expand crop-livestock production which utilizes natural resources as well as to develop necessary energy like electricity and transport infrastructure, ICT industry, and high value-added manufacturing industries such as food processing, textiles, leather, construction materials, mineral processing, etc. In addition, the cultivation of professional engineers is required to develop highly competitive new products by adopting innovative technologies and creating a high value-added industry. A relation between the Vision 2030 and needs of industry is shown in the Figure below.



（Source: Survey Team）

Figure. 1-15 The Relation between the Vision 2030 and Needs of Industry

1.2.1 Trends in Major Industries

(1) Crop-livestock and Food Processing Industry

Agriculture and livestock industry in Mongolia is one of the key industries in Mongolia, which accounts for 13.7% in 2015 of the whole economy. Especially livestock sector, in which the labor force accounts for approximately 1/3 of the total, is the dominant sector with proportion of more than 90% of agriculture and livestock industry. Recently, with the growth in mining industry, the proportion of agriculture and livestock industry to GDP tends to decrease, but the proportion of livestock sector to agriculture and livestock industry has hardly changed.

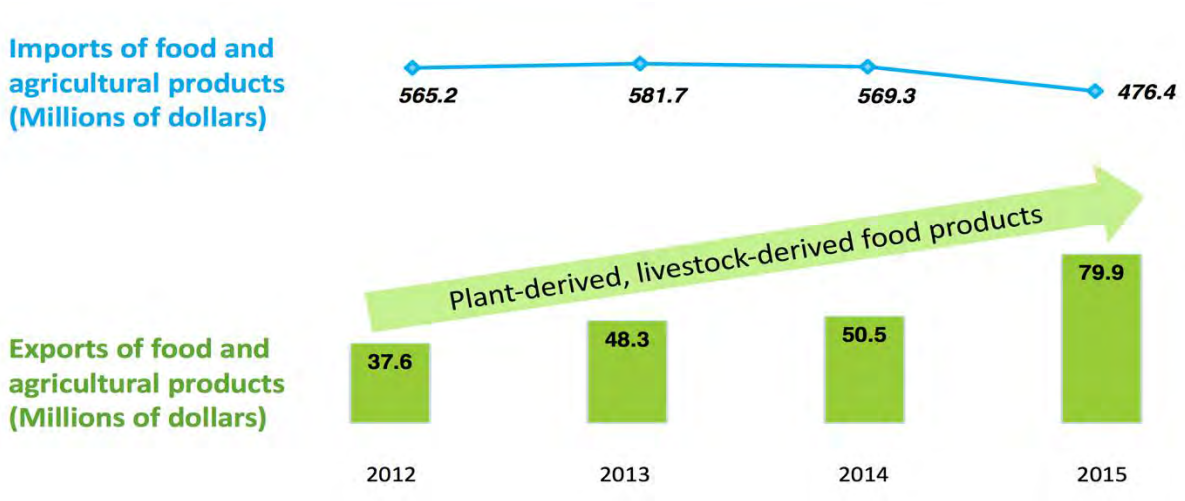
Crop-livestock production in Mongolia is increasing steadily. Especially, raw milk production has doubled from 2010 to 2014. On the other hand, potato production grew steadily until 2012, but began to decrease thereafter.

Table. 1-5Trends in Major Crop-livestock Production (Unit: 1000 tons)

Products	2010	2011	2012	2013	2014
Meat	241.0	210.0	263.4	299.3	294.5
Mutton and Goat Meat	126.9	123.1	123.5	155.0	153.2
Beef	45.1	54.8	59.7	57.7	54.7
Raw Milk	365.7	458.9	588.0	667.0	765.4
Wool and Cashmere					
Wool	18.4	18.9	18.6	21.7	23.9
Cashmere	6.5	4.4	6.3	7.0	7.7
Leather and Fur (Note)	8.1	8.7	7.8	9.9	9.3
Potato	168.0	201.6	245.9	191.6	161.5
Vegetables	82.3	99.1	99.0	101.9	104.9

Note* Unit: Million （Source: National Statistics Office of Mongolia）

It can be seen from trends in agriculture and livestock imports over the past four years from 2012 to 2015, that imports were decreasing gradually from USD 565.2 million in 2012 to USD 476.4 million in 2015. Major import products were prepared food products including coffee, tea, seasonings, soups, etc., tobacco, pastries, sugar confectionery, etc. On the other hand, exports more than doubled from USD 37.6 million in 2012 to USD 79.9 million in 2015, nevertheless, the amount of exports was less than imports. Major export products were wool and cashmere, chocolate preparations, vegetables, nuts, horse meat, etc. In particular, the export of wool and cashmere was increasing significantly during the above mentioned period.



(Source: Ministry of Food, Agriculture and Light Industry)

Figure. 1-16 Exports and Imports of Food and Agricultural Products

The following table summarizes the raw material supply, production and self-sufficiency rate, import ratio, export possibility and problems of major processed foods in Mongolia.

Table. 1-6Outline of Major Processed Foods in Mongolia

Category	Raw Material Supply	Production and Self-Sufficiency Rate	Import	Export Possibility	Problems
Milk and Dairy Products	Dairy cattle: 700,000 420 million L	7659L 20%	80%	High	It is difficult to transport raw milk directly from the production site. Graduate engineers lack expertise on dairy products.
Meat and Processed Meat Products	270 thousand tons Cattle, sheep, goats	130 thousand tons 100%		High 120 thousand tons	There is no inspection and certification system to certify international standards, like SGS. In order to export, innovation of processing technology including product development is necessary. However engineering skills of young generation graduated from university are poor.

（Source：Survey Team）

In addition to the above, measures to cope with infectious diseases like foot-and-mouth disease of livestock, and maintenance of livestock health through vaccination are also listed as basic challenges.

(2) **Mining**

Mining in Mongolia has been sluggish since 2011, affected by decline in resource prices and other factors. Nevertheless, the prices of copper and coal on international market show signs of recovery. Furthermore, there is a bright prospect that the plan of underground mining at Oyu Tolgoi mine has become concrete. There is a need to keep an eye on trends of government mining policy and foreign investment enterprises.

Major export minerals in Mongolia are copper concentrate, coal, gold, and crude oil and iron ore. The gold price fell to UDS 1,156 in 2016 due to the decline of resource prices. However, its price has been recorded in the prospect for revenue at USD 1,724 per ounce (28.3 grams) when budgeting in 2012.
Iron ore price decreased from USD 81 to USD 124 per ton to USD 35 to 43 per ton, and the crude oil price also fell from USD 101 per barrel to USD 60 per barrel.

Although the resource prices have been declining since 2011, production of mineral resources dose not decrease. As shown in the table below, production of copper, coal, iron ore, gold in 2016 increased by 10 to 30% compared to the previous year.

Table. 1-7Trends in Mineral Production in Mongolia 2015-2020

No.	Items	Unit	2015	2016 Target	Forecast			
					2017	2018	2019	2020
1	Copper Concentrate	1,000 tons	1,304.3	1,449.7	1,480.0	1,820.0	1,920.0	1,930.0
2	Coal for Export	1,000 tons	14,500.0	19,500.0	19,500.0	20,000.0	20,000.0	20,000.0
3	Iron Ore (Quality: 56%)	1,000 tons	6,100.0	8,800.0	10,000.0	10,000.0	10,000.0	10,000.0
	Iron Ore	1,000 tons				1,000.0	1,500.0	1,500.0
4	Gold	Kg	11,300.0	13,500.0	14,700.0	16,500.0	18,200.0	20,000.0
5	Zinc Concentrate (Quality: 50%)	1,000 tons	84.0	110.0	130.0	140.0	165.0	165.0
6	Fluorite Flotation Concentrate (FF 95; FF 97)	1,000 tons	68.0	70.0	80.0	80.0	80.0	80.0
	Fluorite Metallurgical Concentrate (FK 75, FK80, FK92)	1,000 tons	212.3	230.0	230.0	230.0	230.0	230.0
7	Molybdennum Concentrate (Quality: 47%)	1,000 tons	4.5	3.7	4.0	7.5	8.0	8.4
8	Oil	1,000 tons	1,099.7	1,080.0	1,087.0	1,481.2	1,487.7	1,506.4

(Source: Ministry of Mining and Heavy Industries)

Although the resource prices have continued to decline, there are signs of recovery recently (see figure below). In November 11, 2016, the copper price on the London market hit USD 5,906 per ton, regained its highest level in 16 months. Regarding coal, the spot price of coal (FOB) at Newcastle Port in Australia exceeds USD 100 per ton in October for the first time since 2012.

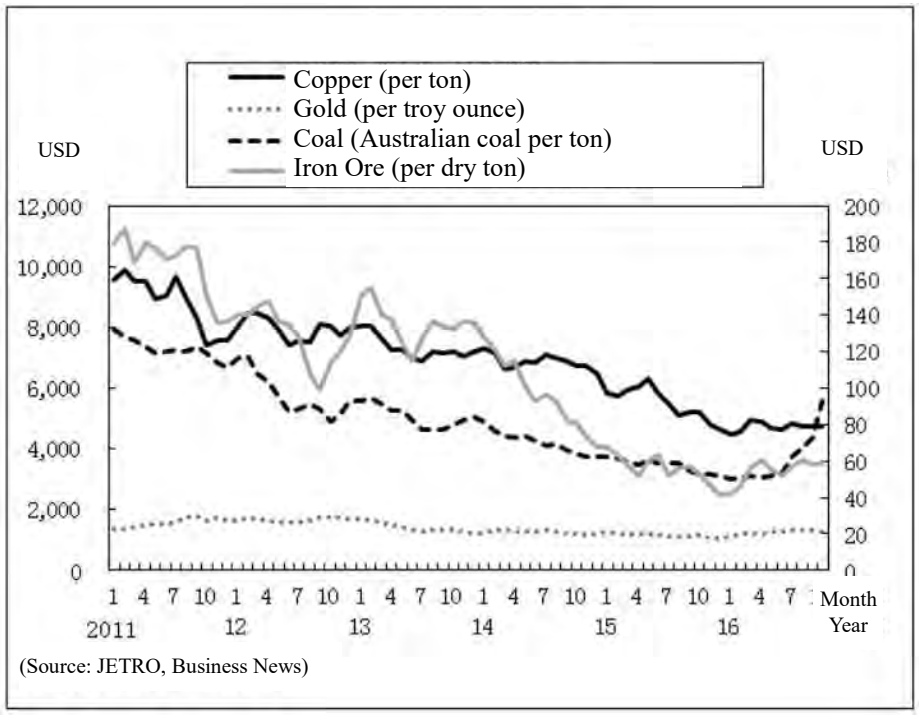


Figure. 1-17 Price of Major Export Minerals

In January, international investors agreed to finance USD 4.2 billion in the development of underground mining in Oyu Tolgoi mine, which is the largest copper mine in Mongolia. According to Oyu Tolgoi LLC, it is preparing to hire dozens of experts and engineers towards the development of underground mining from 2018.

The Government of Mongolia is aiming at developing heavy chemical industry in order to increase added value by utilizing mineral resources. It is planned to develop new factories such as copper smelting, coal derived syngas, coke, steel and metal, refineries. To achieve this attempt smoothly, the cultivation of engineers that can contribute to processing process is urgently required.

(3) Manufacturing Industry (Textile, Leather and Construction Material)

1) Textile Industry

While textile industry in Mongolia is oriented by knitwear made from cashmere, woolen textile, camel fabric, the proportion of cashmere is high. (Table 1-8) In addition, the proportion of production by raw material ratio is 28.5%, which is less than half of that of China. It has a high potential for future growth (Table 1-9).

Table. 1-8Trends in Textile Production

Products	Unit	2012	2013	2014	2015
Washed Cashmere	Ton	1,100.0	900.0	1,400.0	1,800.0
Worsted Cashmere	Ton	417.0	521.8	633.2	754.5
Cashmere wool exports	Ton	3,598.0	4,070.0	4,035.0	N/A
Cashmere Knitwear Products	1,000 pcs	795.6	932.9	954.4	829.3
Woolen textile	1,000 m	314.9	243.0	322.4	N/A
Carpet	1,000 m^2	915.8	852.9	743.6	680.1
Camel yarn	Ton	11.6	9.9	6.7	0.4
Camel blanket	1,000 m	8.2	14.7	18.5	23.0

(Source: Mongolian Business Environment Guide 2017 Summary Version Draft, November 2016)

Table. 1-9 Overview of the Cashmere Processing Industry

Item	World (2013)	China	Mongolia	Afghanistan and others
Number of Goats		143 mil	22 mil	
Production Volume	25,123.0 tons	15,500 tons	7123.0 tons	2,500 tons
Proportion	100%	61.6%	28.5%	9.9%

(Source: Ministry of Food, Agriculture and Light Industry)

Cashmere production is a traditional industry in Mongolia. The GOBI Corporation, a world famous company, is a representative company in this industry. In 1976, it was used to be an experimental factory based on aids from United Nations, and in 1977 technology and equipment were introduced by Japan's grant aid. In 1987, the present GOBI Corporation was founded through privatization. As for industry

structure, this industry consists of 5 major companies like GOBI Corporation, 40 small and medium enterprises, and about 200 family businesses.[5]

In order to promote the textile industry with utilization of Mongolian wool and cashmere as raw materials, it is vital to improve the quality to strengthen export competitiveness and train engineers that can contribute to product development, as well as strengthen raw material supply chain.

2) Leather Industry

Leather processing industry in Mongolia consists of processing and exporting factories of untreated animal skin materials, leather and fur clothing. It is one of the major economic sectors in the country. Leather processing industry in Mongolia depends on nomad and meat processing industry to procure raw materials. According to the Mongolian Leather Industry Association, the number of affiliated companies is 136 and most of them are small and medium enterprises, but there are about 700 raw material buyers nationwide.[6]

Looking at the trends in production over the past few years, it turns out that the production of sheepskin and goat leather are growing bigger than that of cowhide and horse skin, which remains on the same level (see table below). Also, in leather industry, 8-10 million pieces of semi-finished products are processed before tanning process, and only 1 million pieces are left during last stage of its processing as leather materials.[7] Many products are exported to China as semi-finished products.

Table. 1-10Trends in Leather Production

	2012	2013	2014	2015
Lambskin	3.7	5.2	5.0	7.4
Goatskin	4.0	4.7	4.3	6.2
Cowhide	0.5	0.5	0.4	0.7
Horsehide	0.2	0.2	0.2	0.4
Total	8.6	11.0	10.2	15.2

(Source: Mongolian Business Environment Guide 2017 Summary Version Draft, November 2016)

To develop leather industry in Mongolia, there are many challenges such as improvement of design and branding, as well as environmental problems, but there is a growing demand for nurturing engineers that can contribute to the improvement of product quality.

3) Construction Materials (Cement, Steel Frames and Reinforcing Steel)

Regarding the construction materials industry, production has been shrunk sharply as public investment and private investment declined due to slowdown of Mongolia's economy. As for industry structure, the three major cement enterprises have a share of approximately 20%, but it is said that there are

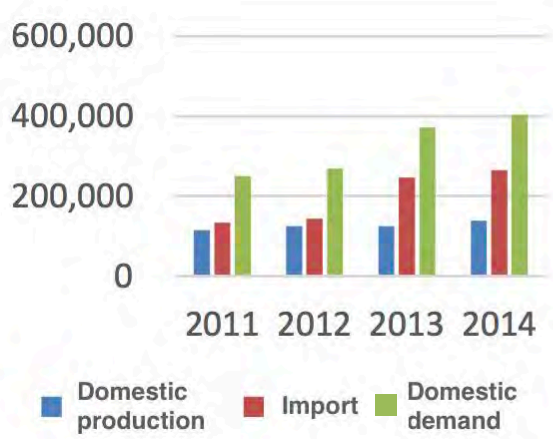
[5] Based on the interview with GOBI Corporation
[6] Mongolia Business Environment Guide 2017 summery version (Draft in November 2016) p.38
[7] Same as above

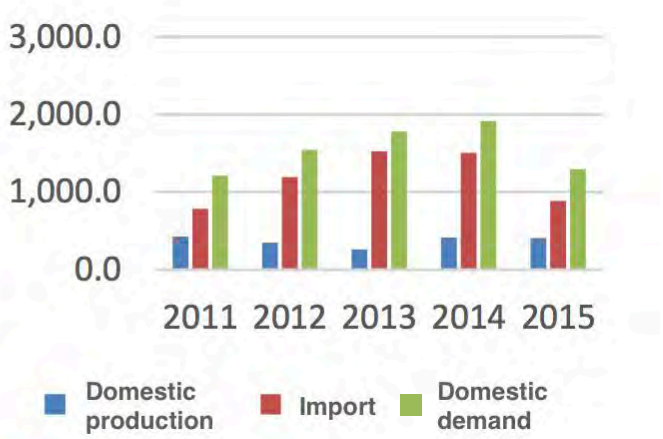
about 100 enterprises in total, according to hearing survey with a large company. The import dependency of cement products in 2015 was 68%, but in the past few years, new and expansion investment has become active. Meanwhile, 86% of steel frames and reinforcing steel are imported from China, South Korea, etc.

Table. 1-11Production of Major Construction Materials and Construction Investment

Investments, Products	Unit	Production Volume			
		2012	2013	2014	2015
State construction investments	mil MNT	1,307.864	1,102.839	1,146.557	447.166
House construction amount	mil MNT	389,418	856,903	1,430,863	N/A
Newly built apartment	Number of Units	11,413	18,012	22,546	N/A
Increase in housing stock	1,000 m^2	531	906	1,604	N/A
Cement	1,000 tons	349.4	258.8	411.3	410.1
Concrete / Mortar	mil pcs	176.2	317.8	432.6	129.0
Clay brick	1,000 m^2	44.5	66.5	58.9	41.5
Timber		14.2	9.8	16.4	15.2
Wooden door and window	1,000 m^2	7.2	12.4	14.6	7.8
Construction materials imports	mil dollar	279	336	330	N/A

(Source: Mongolian Business Environment Guide 2017 Summary Version Draft, November 2016)





(Source: Mongolian Business Environment Guide 2017 Summary Version Draft, November 2016)

Figure. 1-18 Production and Import of Cement

Figure. 1-19 Production and Import of Steel

In order to promote construction material sector in Mongolia, it is necessary to manufacture products that can withstand quality and price competition with imported goods such as cement, steel from overseas including China. In addition, the cultivation of engineers who can contribute to such manufacturing technology is required.

4) Construction Industry

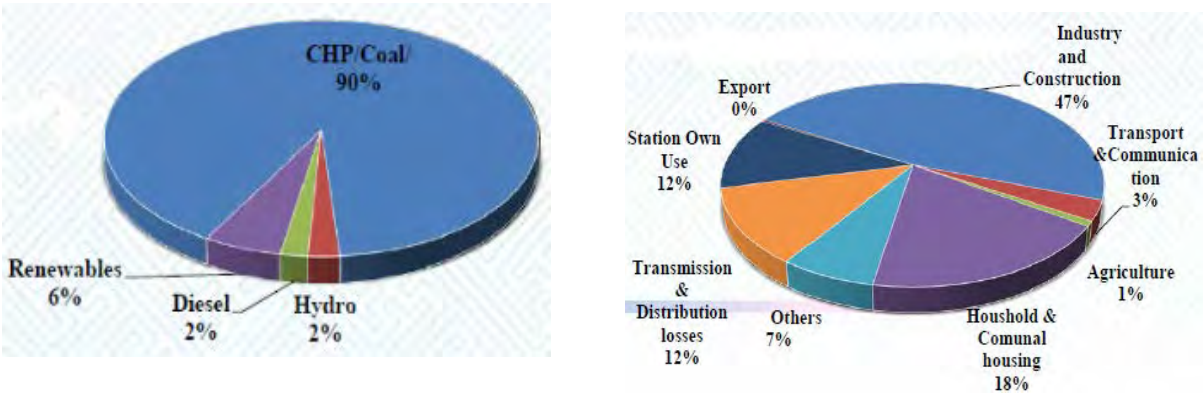
The construction market in Mongolia has expanded steadily due to its high economic growth until 2014. However, private housing investment and government public works have decreased drastically and the market has shrunk sharply due to a slowdown of economy after 2015. The share of construction and real estate industry in GDP decreased from 7.1% in 2010 to 6.7% in 2015. Many construction companies in Mongolia, that conduct real estate activities as well, purchased the land at high prices to build apartments and commercial facilities, while the economy was blooming by the mines boom until 2013. Many companies that could not sell or rent their facilities due to the subsequent economic downturn, have suffered loss as a result. Regarding construction company, there are 18 general contractors and 300 to 400 companies in both large and small size. Meanwhile, 780,000 people are engaged in the entire construction industry.
However, in terms of medium to long term, the potential in the construction market is great. For example, government planned to conduct migration of 180,000 households in Gel district as well as infrastructure development and apartment construction to improve air pollution in Ulaanbaatar over the next 4-8 years. According to the interview with the Construction Contractors Association, a demand of approximately 400 billion yen is expected just for infrastructure development, and there is a potential demand of approximately 800 billion yen in total including construction of apartment. In addition, market for related infrastructure development such as roads and power generation facilities is expected to expand significantly, as long as the underground mining at Oyu Tolgoi copper mine can start from 2018.

According to the interview with the Construction Contractors Association and major construction companies, there is a high demand of the project management of young engineers as well as analytical skills of construction materials as Mongolia is behind in engineering education in university since its transition to democracy. The Construction Contractors Association is conducting re-education for engineers and training for professional engineering certification.

5) Energy

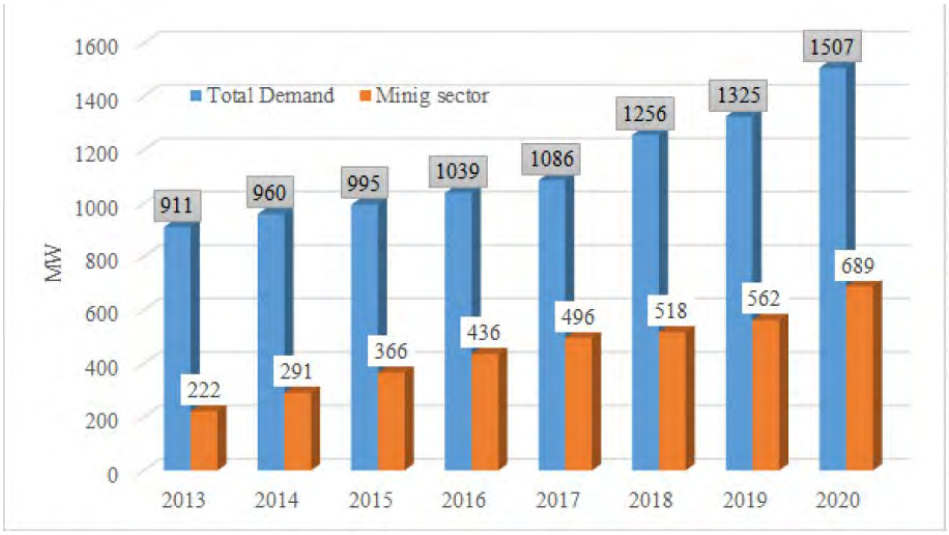
Generation capacity in Mongolia as of 2015 was 1,122 MW, and coal-fired power generation accounted for 79.3% of the total energy consumption. Imports of electricity from Russia accounted for 18.8%, and the proportion of renewable energy such as hydropower and wind power was less than 1% each. The share of consumption sector is 47% in industry and construction, 18% in household and communal housing and 12% in transmission and distribution losses.

It is expected that the future electricity demand will grow rapidly after 2018 and will expand to 1.5 times in 2020 compared in 2015.



(Source：Ministry of Energy, "Mongolian Energy Sector", 2015)

Figure. 1-20 Ratio of Energy Sources and Consumption Sector, 2015



(Source：Ministry of Energy, "Mongolian Energy Sector", 2015)

Figure. 1-21 Energy Demand in Mongolia and its Forecast, 2013-2020[8]

In addition, the Government of Mongolia plans to reduce the dependency of coal-fired power generation in terms of environmental protection, and to expand power generating capacity of renewable energy such as hydropower, solar power, wind power and biomass. Specifically, the government has set an ambitious goal to raise the ratio of equipment capacity of renewable energy from 6% in 2015 to 20% by 2020. As future challenges, since a training of renewable energy engineers is behind, it is necessary to train engineers who have knowledge of the latest equipment as well as skills of plan development, design and enforcement of power plants such as solar power, wind power, and biomass, etc.

6) Medical

Health care system in Mongolia has improved greatly in recent years, especially in Millennium Development Goals (MDGs), a remarkable progress shows in child mortality rate and maternal health.

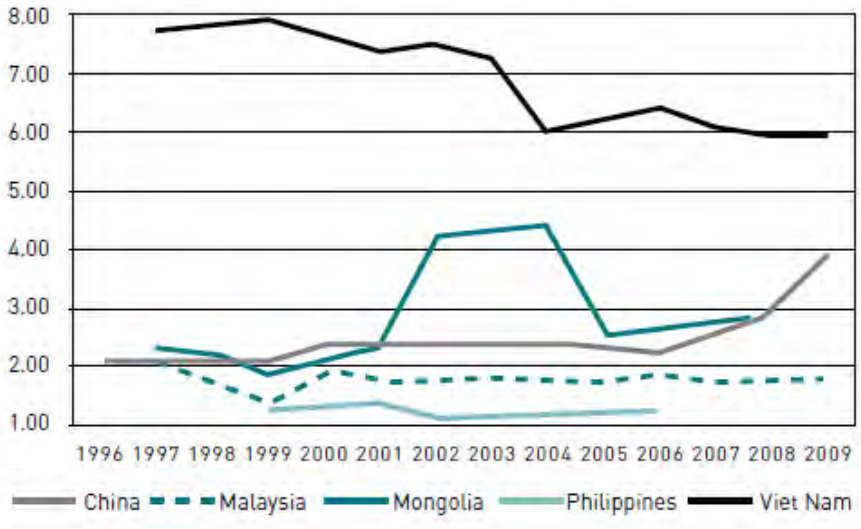
[8] The forecast above does not include the new electricity demand of underground mining at Oyu Tolgoi mine

Table. 1-12MDGs Indicators, 1990-2012

Targets/Indicators	1990	2000	2010	2011	2012	Target 2015
REDUCE CHILD MORTALITY						
Under five mortality rate (per 1000 live births)	97.2	44.5	25.6	20.2	18.9	21.0
Infant mortality rate (per 1000 live births)	65.4	32.8	20.2	16.5	15.5	15.0
Proportion of children immunization against	82.3	92.4	96.9	98.1	98.8	99.0
IMPROVE MATERNAL HEALTH						
Maternal mortality rate (per 100.000 live births)	121.6	166.3	47.4	48.7	51.5	50.0

（Source: Based on Ministry of Economic Development, MDGs 5th National Progress Report 2013”）

The figure below shows the comparison of the number of hospital beds per 1000 population in the region. While the number in Mongolia as of 2008 is nearly the same level as China, it is higher than Malaysia and Philippines. In Ulaanbaatar, the number of private hospitals and clinics has increased 1.5 times in three years from 2006 to 2008. Meanwhile, foreign companies including Korean companies are expanding into hospitals with well-equipped facilities. [9]



（Source：World Health Organization, Mongolia Health System Review （2013））

Figure. 1-22 Hospital Beds per 1000 Population

As future challenges, it is required to improve the quality of secondary and tertiary care by expanding hospital services in rural areas and strengthening license control on private hospitals [10]. In addition, according to the interviews with the hospitals, the respond to sophistication of therapeutic techniques has become a major challenge due to the shortage of doctors and medical devices, especially in pediatrics, gynecology, brain and cardiac surgery.

[9] ADB, Mongolia Hospital Subsector Analysis, 2013
[10] Same as above

7) ICT

The ICT field in Mongolia consists of communications, IT, radio, TV broadcasting and postal services. In recent years, remarkable progress has been made. The Internet market is tremendously growing, driven by the government's "e-Mongolia National Program" and "ICT Vision 2021". According to the latest Global IT Report 2016 published by the World Economic Forum, the Mongolian Networked Readiness Index has increased by 0.1 points from 4.2 to 4.3, and ranked 57th among the 139 countries. (+ 4 compared to the previous year)

Table. 1-13ICT Index in Mongolia

Fields	2011	2012	2013	2014
Number of Internet Users (population)	344,000	459,000	520,000	580,000
Number of Mobile Phone Owners (millions of population)	2.9	3.4	4.25	4.5
Mobile Phone Penetration Rate	104%	115%	142%	145%

(Source：BuddeComm)

Regarding the e-Mongolia National Program mentioned earlier, the government has announced various policies such as IT development of administrative procedures, information communication infrastructure development, industry deregulation, legal system development, promotion of e-commerce, and reduction of information gaps and cost reduction of Internet access.

〈Trends in Mobile Phone Market〉

In 1996 Mobicom began to offer GSM service as a joint venture company of Sumitomo Corporation (44.4%) and KDDI (44.4%). In 2007, Mobicom signed an agreement with Alcatel-Lucent to expand existing networks and build NGNs nationwide. In April 2009, the company launched its HSPA service with the network supplied by Ericsson, which enabled videophone and mobile TV and high-speed Internet connection of up to 7.2 Mbps.

In 2006, Unitel launched GSM service, and in 2007 G-Mobile launched CDMA service. Unitel also acquired a 3G license in December 2008. It started 3G service in Ulaanbaatar, and in August 2009 began to offer HSDPA service. G-Mobile has introduced CDMA 2000 1x EVDO, and established a 3G network linking all local facilities by 2009.

As of June 2015, the number of mobile phone subscribers is approximately 4.8 million, with Mobicom 33.14%, Skytel 25.63%, Unitel 31.65% and G-Mobile 9.58% by share. [11]

In addition, the Government has set the following ICT dissemination target in "e-Mongolia National Program".

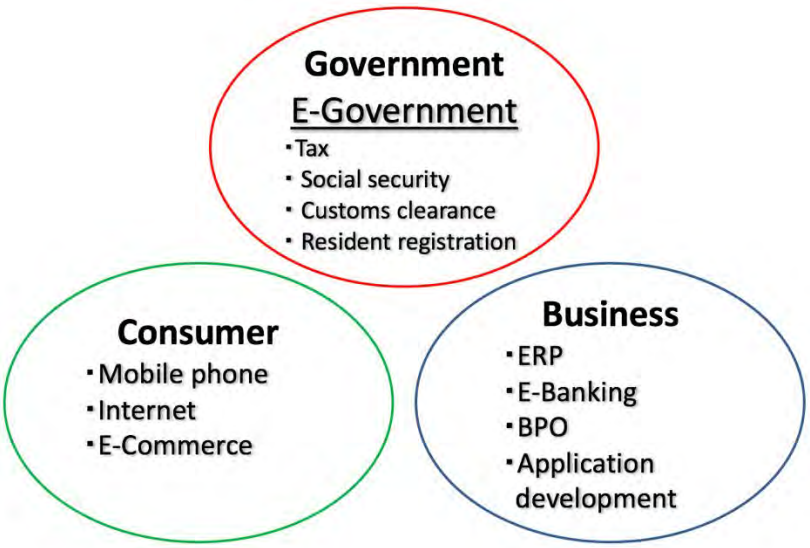
- National Satellite: Launch communication satellites and provide a remote education and telemedicine services including remote areas and provision.

[11] Information from the website of the world information communication situation

- Seamless government services: Provide seamless e-government services by establishing a related base including the construction of integrated database.
- Free Wi-Fi service in rural areas: Increase Wi-Fi usage level, in addition to mobile broadband such as 3G / 4G.
- Development and manufacturing support for electronic products
- Cultivation of advanced ICT human resources (human resources that develop e-Government services, e-commerce, work efficiency improvement services, etc.)

<Software Sector>

According to Mongolian Software Industry Association (MOSA), there are approximately 300 software development companies in Mongolia, while approximately 50 companies are active. The market can be roughly divided into three areas: (1) government digitization project, (2) major enterprises / bank system construction project, (3) consumer mobile phone.



(Source: Based on various materials)

Figure. 1-23 Overview of ICT market in Mongolia

Typical public projects include (1) digitization of social insurance, (2) digitization of public services of Ulaanbaatar City, (3) digitization of tax system, (4) digitization of customs system, etc. In either case, foreign software companies from Korea and China are receiving orders. Besides this, as there are digitization projects related to health under the support of Chinese government, Chinese enterprises are receiving orders.

The government is planning to train more than 1000 IT personnel at least twice as many times as at present. However, according to MOSA, there are qualitative and quantitative shortages of mid-career professionals such as programmers and designers in terms of human resource development.

8) Other Service

(1) Education

Regarding the school education system of Mongolia, the government instituted 10-year system (5-3-2) under the strong influence of the former Soviet Union, and shifted 11-year system (5-4-2) in 1998 -1999 academic year to the 12-year system (5-4-3) in 2014 – 2015 academic year. After the transition, the nine-year schooling in primary and junior secondary schools pertains to compulsory education. Reform has been implemented since 2010, to keep the curriculum in primary and secondary education in accordance with the international standards.

In Mongolia, it has begun to shift to more flexible and modern education system since the establishment of private educational institution in 1991 after the transition to democracy. Higher education indicators are as shown in the table below. The university entrance ratio is very high compared with other developed countries.

Table. 1-14Higher Education Indicators in Mongolia

	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
(Full Time) Number of graduates from tertiary institution	34,521	40,005	40,371	35,010	19,735	36,562	
Number of high school graduates entering university	31,334	30,536	33,328	33,273	30,537	17,828	27,626
Number of students entering national universities	19,528	17,772	19,499	18,189	18,108	12,146	16,605
Number of students entering private universities	11,806	12,764	13,829	15,084	12,429	5,682	11,021
University entrance rate	83.0	88.5	83.3	82.4	87.2	90.3	75.6

(Source: Based on Statistical Year Book Education and Science, 2015-2016 academic year)

As the current situation of universities and vocational schools (Technical Vocational Education and Training: TVET)[12] will be mentioned in details in a later chapter, it is omitted in this section. Currently, 100 Mongolian universities have been established in Mongolia, of which 80% of them are private universities. It has been pointed out that there are too many colleges and universities for a population of three million. Private universities can be established relatively easily, and there exist many universities with low quality of teachers and curriculum[13]. Therefore, ADB is cooperating with the government through the Higher Education Reform Project (Pr. 43007-023) to implement educational reforms to improve the quality of higher education in Mongolia, and it is carrying out a program of accreditation of 20 domestic universities.

There are 80 TVET institutions including 49 public schools and 31 private schools in the period from 2015 to 2016. The number of TVET institutions for a population of three million is higher than other countries, and many schools are located in rural areas. [14]

[12] It is vocational school that aims at helping people to acquire vocational skills. Graduates from junior secondary education can join TVET, which further requires 2.5 years to complete and will be given a complete secondary education diploma. In Mongolia, the Ministry of Labor and Social Protection is in charge of it.
[13] Myagmardorj Buyanjargal, “Universities and Education in Monglia”, The UB Post, September19, 2016
[14] JICA, Information Collection and Confirmation Survey on Higher Engineering Education, 2013

The Government of Mongolia is also in the process of improving the quality of education for college education and TVET. The number of educational institutions is expected to be cut down. Regarding human resources, it is required to improve the curriculum that can meet the latest needs of industry and improve the quality of teachers who are responsible for providing educational guidance to students.

(2) Tourism

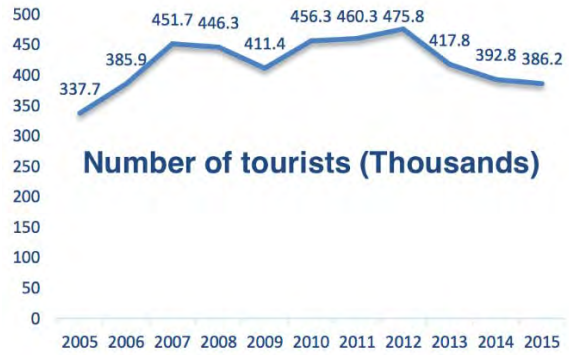
In recent years, the Government of Mongolia has been focusing on tourism promotion which is also positioned as one of the strategic industries for sustainable economic development in "Vision 2030". Currently, there are 403 travel agencies, 320 hotels and 317 resort and tourist camps in Mongolia[15].

The government formulated the "National Tourism Development Plan" (June 2015) and undertook the following measures as priority policies: (1) improvement of tourism infrastructure, (2) tourism development through utilization of regional attractions, (3) construction of tourism related research and information system (transmission of sightseeing information), (4) human resource development, (5) overseas marketing, (6) enhancement of domestic tourism.

In addition, to boost foreign investment in tourism, the Government offers special tax exemption equaling up to 10 percent of the total investment if offered for construction of high-rated hotels and tourist complexes. Licenses for tourism business were abolished and service provided by tour operators for expatriate visitors is now exempt from VAT.

The number of tourists peaked at 475,800 in 2012, and has declined over the past three years. The government recognized that the expensive airfare and hospitality at accommodation facilities resulted in this decline. Foreign visitors from Russia, South Korea, and in particular China account for almost 70% of foreign visitors.

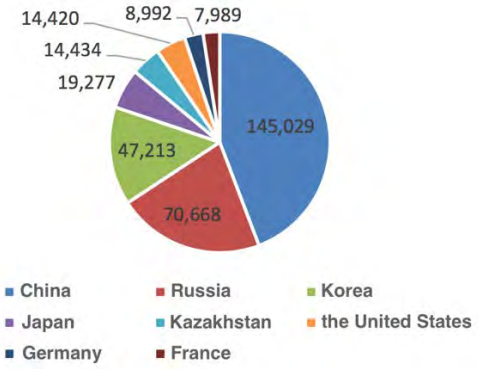
On the other hand, as was shown in the trends in annual income of hotel sector, it has more than tripled in three years, from USD 77.4 million in 2010 to USD 244.7 million in 2013. Rapid growth has been achieved during this period. International luxury and intermediate hotels have been constructed one after another.



(Source: JICA and Mongolia Joint Seminar on “Information Collection and Confirmation Survey on Investment Environment and Promotion)

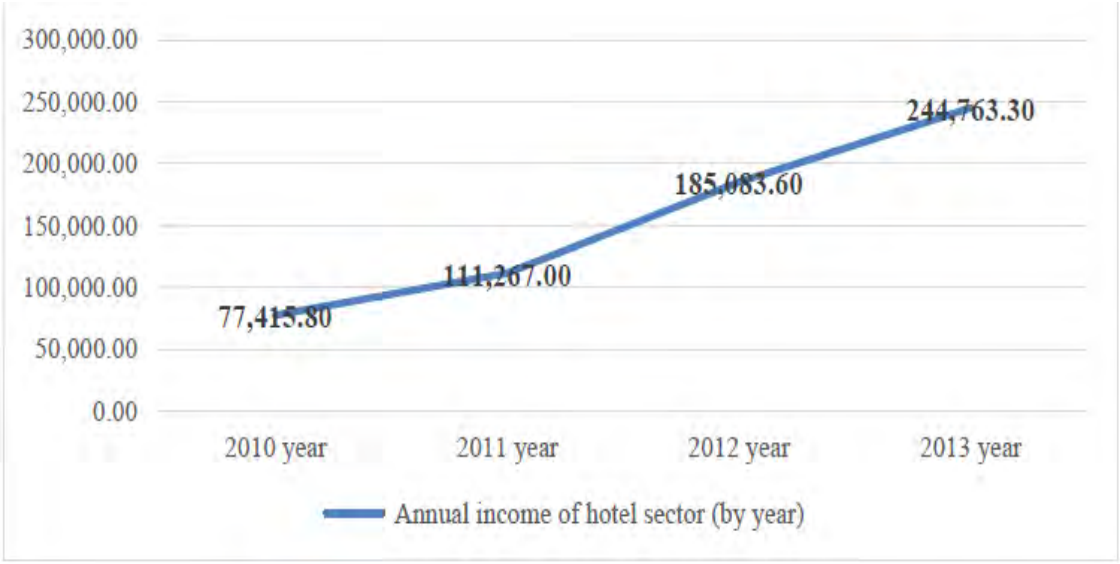
Figure. 1-24 Inbound Tourists to Mongolia

[15] Ministry of Environment and Tourism



(Source: JICA and Mongolia Joint Seminar on "Information Collection and Confirmation Survey on Investment Environment and Promotion)

Figure. 1-25 Breakdown of Inbound Tourists, 2015



(Source: Lhamstseden, Current Situation of Mongolian Tourism and Hotel Industry, 2015)

Figure. 1-26 Annual Income of Hotel Sector, 2010 – 2013 (Thousands of dollars)

As future challenges, experts mentioned as follows: [16]

- Large-scale seasonal fluctuations (concentration of tourists in summer)
- Limitation of types of tourist services
- Quality of services has not reached the international standards
- Lack of communication skills and service spirit of service staff
- Lack of OJT, OFF-JT training education system related to hospitality improvement of staff from hotel and other accommodation facilities.

[16] Lhamstseden, Current Situation of Mongolian Tourism and Hotel Industry, 2015

1.2.2 Major National Development Projects

According to the National Development Agency (hereinafter referred as NDA) of Mongolia, specific sectors of investment attraction include (1) infrastructure development, (2) agriculture and fishery, (3) industry (food processing, light industry, construction materials, copper processing plants, coal and petrochemical, steel and metal), (4) tourism industry and (5) mining industry.

Typical national development projects under planning by the Mongolian Government are shown in the table below. [17]

Table. 1-15National Development Projects to Promote Economic Growth

Sectors	Project Title	Investment Amount	F/S
Construction Material Production	Asbestos Factory	$20 mil	Yes
Railway Construction	Tavan Tolgoi - Gashuun Sukhait Railway	$1.3 bil	Yes
	Oyu Tolgoi Branch Line	$120 mil	Yes
	Tavan Tolgoi - Sainshand - Hoot - Choibalsan Railway	$1.65 bil	Yes
Refining	Refinery	$1.2 bil	Yes
Steel / Metal	Darkhan – Selenge region of steel and metal industrial area and infrastructure construction	$0.8 bil	On going
	Erdenet Metal Industrial Zone	$80 mil	Yes
Copper	Copper refining plant	$0.8 bil	Yes
	Erdenet copper refining plant	$36 mil	Yes
Energy	Metallurgical coke and clean energy complex zone project	$0.23 bil	Yes
	Capacity enhancement of the third power plant of Ulaanbaatar (250MW)	$0.35 bil	Yes
	Tavan Tolgoi thermal power plant	$1 bil	Yes
	Expansion of Dornod thermal power plant	$90 mil	Yes
	New thermal power plant and power grids at each prefectural capital	$0.13 bil	Yes
Agriculture and livestock	Agriculture and livestock farming technology park	$0.3 bil	Yes

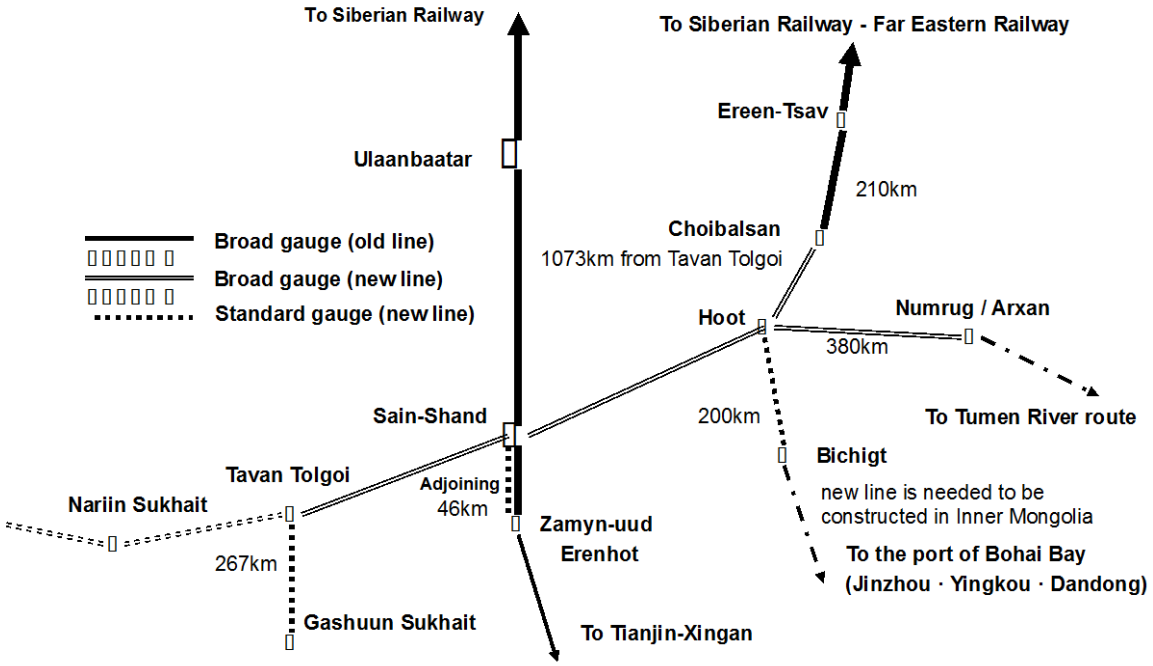
(Source: NDA, Foreign Investment Attraction Policies and Opportunities in Mongolia, November 2016)

<Railway Construction>

Regarding infrastructure construction, the government is mostly focusing on railway construction based on the South Gobi where major mines are located. The Government of Mongolia established Mongolian Railway Co., Ltd. and is conducting bidding through PPP. Mongolian railroads and construction of each area including locomotives, freight cars, rails, sleepers, signaling facilities and construction, are bidden separately. The

[17] The contents of the projects and the three sectors covered in the table below are the typical contents that the Government of Mongolia is planning. It does not necessarily mean that the feasibility is taken place.

Mongolian railway is planning to build 1,800 km railway network over the medium- and long-term. As a core project, the Government of Mongolia is planning to build Gashuun Sukhait Railway (267km) on the Chinese border, and Sainshand - Hoot - Choibalsan (1073 km) Railway to connect Russia with the aim of expanding and facilitating exports of Tavan Tolgoi coal field which is one of the largest coal field in the world.



(Source: NPO Northeast Asia Transportation Corridor Promotion Network (NEANET))

Figure. 1-27　Mongolian Railway Construction Plan

<Thermal power plant>

As of 2015, the power generation capacity of entire Mongolia was 1122 MW, of which coal-fired power plants account for approximately 90%. The Government of Mongolia has planned to construct a 600 MW thermal power plant in Tavan Tolgoi where major mines including Oyu Tolgoi copper mine are located in order to cope with the future increase in electricity demand in the mining sector (investment amount is USD 1 billion). The plant has a generating capacity of 450 MW at first and is designed to be extended to 600 MW in the future. The Government of Mongolia initially used bridge financing of USD 51 million. However, at the end of February 2016, a consortium consisting of Marubeni from Japan and two companies from Mongolia (owners of MCS and Coal Mine Energy Resource Inc.) has won the tender.[18]

＜Agriculture and Livestock Farming Technology Park＞

The Government of Mongolia emphasizes the promotion of agriculture and livestock farming, and is trying to improve the competence of human resources to introduce modern technology and to improve the competitiveness and quality of agricultural products. As one of the measures, the government plans to establish agriculture and livestock farming Technology Park. Specifically, the government is aiming to

[18] CEE, Tavan Tologoi Power Plant Project Brief, October 2016

construct complex facilities that attract the following factories and facilities in processing related to agriculture and livestock farming sector and its products. (Investment amount: USD 300 million)

- Meat / meat product processing complex factory
- Dairy processing plant
- Leather factory
- Related by-product factory
- Fresh plant factory
- Agricultural products / raw materials warehousing
- Vegetable processing plant
- Automated warehouse of potatoes and vegetables
- House agriculture
- Knit factory
- Garment factory
- Mineral water factory
- Business incubation center
- Wholesale center
- Transport center
- Machine repair center

(Source: NDA, Foreign Investment Attraction Policies and Opportunities in Mongolia, November 2016)

Chapter 2. Study and Analysis on Human Resource/Workforce Demand for Industrial Sector in Mongolia

With the purpose of understanding engineering workforce demand/needs for main industrial sectors in Mongolia, 32 establishments are surveyed using face to face interview method. Regarding the demand of engineering workforce, a practical engineers with inventive skills who can develop new products using latest technology development and innovations; and who can develop and execute quality control and process management with a creative mindset are much needed. For higher education institutions as well, it is crucial to prepare engineering workforce with practical skills and teamwork capability using combination of the latest technology and teaching method that is compatible with international standards.

2.1 Study Objective

The study aims to understand engineering workforce demand of main industrial sectors in Mongolia according to following context:

- ✓ To define the role of engineering workforce in prospective industrial sectors
- ✓ To define the gap between demand and professional skills of engineering workforce in industrial sectors
- ✓ To identify sectors where engineers needed for further preparation
- ✓ To determine the requirements for higher education institutions specialized in industrial field

When Japan International Cooperation Agency (hereinafter referred to as JICA) conducted "Data collection study on Mongolian higher education institutions for engineers and technology" in 2013, they studied as well to determine the human resource demand and needs of industrial sector, however, this study is different in terms of purpose, objective, and methodology as follows because it is conducted during the period of major changes in the economy.

① Regarding the study objectives, analysis of gap between role and professional skills of engineer has been added the study.

② Regarding the study sample, for the previous study, mining and construction establishments formed more than 50% of the sample due to the growth of mining sector that time. However, for this study, based on the economic situation since the mining boom, we have reduced the ratio of mining and construction establishments to diversify the sample components focusing on manufacturing sectors via covering all the manufacturing/industrial establishments from first stage to third stage manufacturing sectors known as prospective manufacturing.

③ Regarding the study methodology, to have detailed analysis on each specific sector, we have conducted in-depth interviews instead of questionnaire based interview with reduced number of target establishments.

2.2 Study Methodology

2.2.1 Steps of the Study

The study is implemented per following steps.

(1) Choosing of Prospective Industrial Sectors

Following 12 sectors are selected based on prospective contribution they could make to Mongolian industrial sector diversification as per main industrial sectors in need of engineer and technology workforce, "Principles of sustainable development of Mongolia 2030" and Government action plan.

- ✓ Agriculture and livestock
- ✓ Mining industry
- ✓ Food processing industry
- ✓ Textile and garment industry
- ✓ Leather industry
- ✓ Construction material industry
- ✓ Energy/power industry
- ✓ Construction industry
- ✓ Medical industry
- ✓ ICT industry
- ✓ Other industrial sectors (such as automotive parts, machinery parts, home furniture, pharmaceutical products, day-to-day needs items etc.)
- ✓ Other service sectors (such as education, car sales and parts repair, hotel and restaurant, logistics, heavy equipment sales and maintenance, etc.)

(2) Preparing Discussion Guide for In-depth Interviews

General discussion guide across all sectors was developed for in-depth interview. (Appendix 4)

(3) Sending Request to Connect and Introduce the Establishments to the Organizations

Among organizations that has close relationship with abovementioned sectors, Mongolian National Chamber of Commerce and Industry, representative body of business organizations, and Mongolia-Japan center for human resource development, well known through business and production management trainings for small and medium enterprises, were requested to interview establishments. And with help of other communication means, appointment requested to meet local large-scale enterprises and Japanese enterprises established in Mongolia.

(4) Carrying Out Interviews with Establishments

Fieldwork of the research has been carried out from Dec 21, 2016 to Jan 30, 2017.

2.2.2 Study Sample

32 establishments have been surveyed per abovementioned study steps and methodology. Breaking down the total sample by the source of collection:

- ✓ Establishments contacted through Mongolia-Japan center for human resource development: 14 companies
- ✓ Establishments contacted through Mongolian National Chamber of Commerce and Industry: 8 companies
- ✓ Local large-scale enterprises in Mongolia: 5 companies
- ✓ Japanese enterprises established in Mongolia: 5 companies

2.3 Result of Survey

2.3.1 Profile of Establishments Participated in the Survey

(1) Size of Establishments

Classifying establishments participated in the survey by the size, there were 12 large-scale companies (38%), 17 medium-scale companies (53%) and 3 small-scale companies (9%) participated in the survey. Classification of establishment size was based on Mongolian Law of Small and Medium Enterprises as per following:

- ✓ Large-scale establishments: 200 and above employees, annual sales above 1 billion 500 million tugrugs
- ✓ Medium-scale establishments: 20~199 employees, annual sales of 250 million to up to 1 billion 500 million tugrugs
- ✓ Small-scale establishments: up to 19 employees, annual sales up to 250 million tugrugs

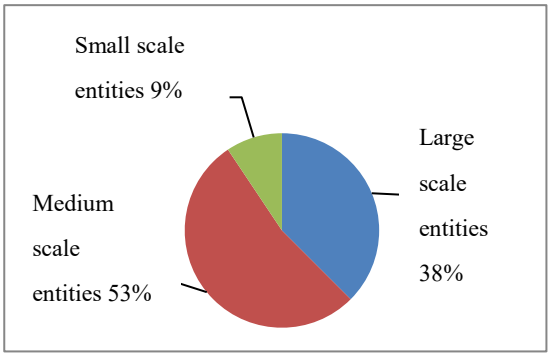


Figure. 2-1 Percentage of Eentities

No.	Size of entities	Number of entity
1	Large Scale	12
2	Medium Scale	17
3	Small Scale	3
Total		32

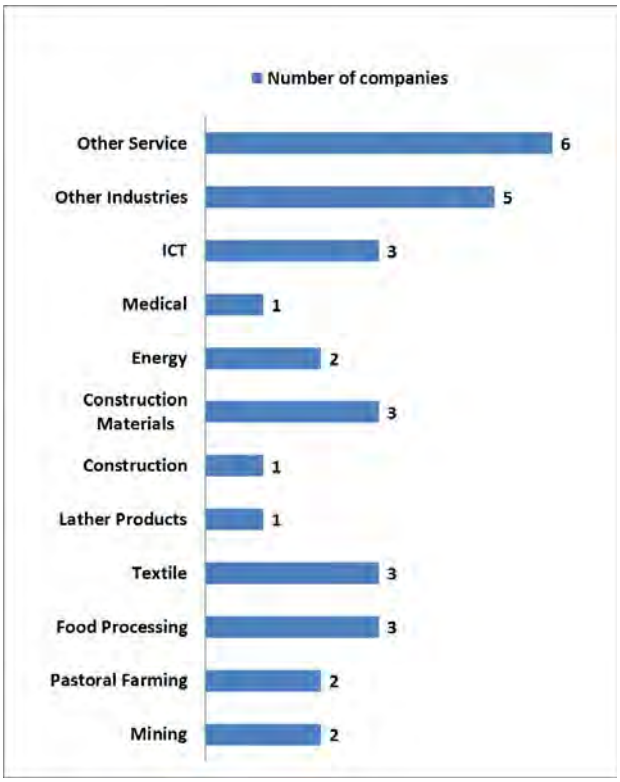
(Source: Processed by research team based on interview findings)

Table. 2-1 Number of Entities (by size)

(2) Type of Industry

Following figure is based on industry type of establishments participated in the study. Highest number of establishments by industrial type is 'Other service sectors' with 6 companies which includes education-1, car parts repair-2, hotel and restaurant-1, logistics-1 and heavy equipment sales-1. Followed by 'Other industrial

sectors' with 5 companies which includes 1 company each from automotive parts, machinery parts, home furniture, pharmaceutical products, and day-to-day needs items. Furthermore, 3 companies each from ICT, construction material, textile and food processing sectors while 2 companies each from energy/power, agriculture and livestock; and mining. Also 1 company each from medical, construction and leather industry.



(Source: Processed by research team based on interview findings)

Figure. 2-2 Number of Establishments by Industry Type

(3) Establishment and Type of Capital

When looking at establishments by its activity type, highest number of activity type was Limited Liability Company: LLC 81% (26 companies) followed by State Owned Enterprise: SOE 13% (4 companies) and Joint Stock Company: JSC 9% (2 companies).

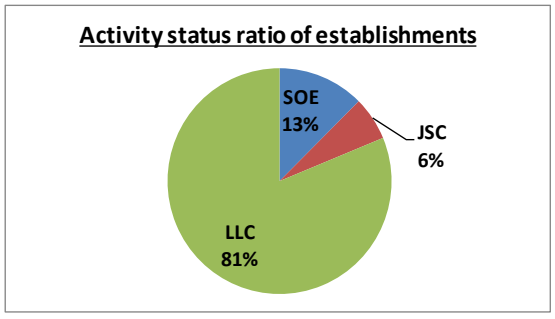
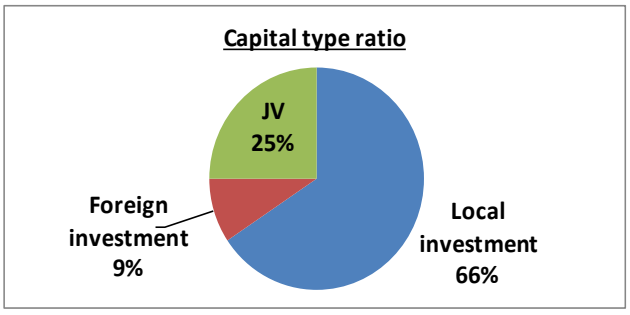


Figure. 2-3 Activity Type Ratio of Establishments



(Source: Processed by research team based on interview findings)

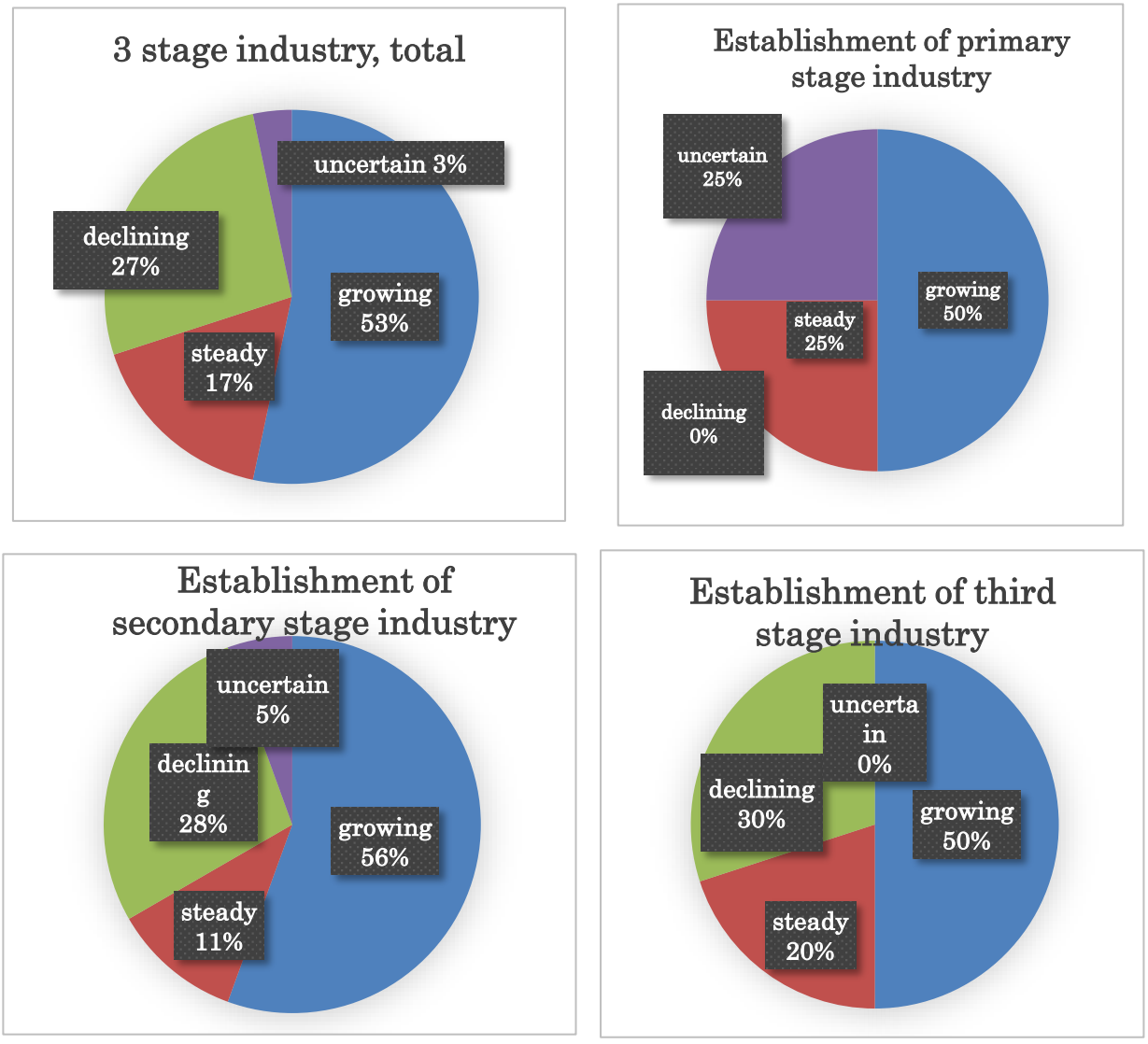
Figure. 2-4 Capital Type Ratio of Establishments

2.3.2 Business and Industry Trends of Establishments Participated in the Survey

1) Business in each Stage of 3-stage Industry and Industry Outlook

Based on the in-depth interview with each establishment, we have classified all establishments participated in the survey in terms of 3-stage industry and examined generic industrial outlook. As per the responses provided by establishments, establishments are classified into 4 groups which are growing, steady, declining and uncertain. Regarding the industrial outlook, out of valid response of total 30 companies, 16 companies (53%) mentioned they are growing, 5 companies (17%) are steady, 8 companies (27%) are declining and 1 company (3%) is uncertain.

As per industrial stage of establishments, growth of secondary stage industry (manufacturing) is the highest with 56% and primary stage industry (agriculture and livestock, mining) and third stage industry (service sector) growth noted 50% respectively.



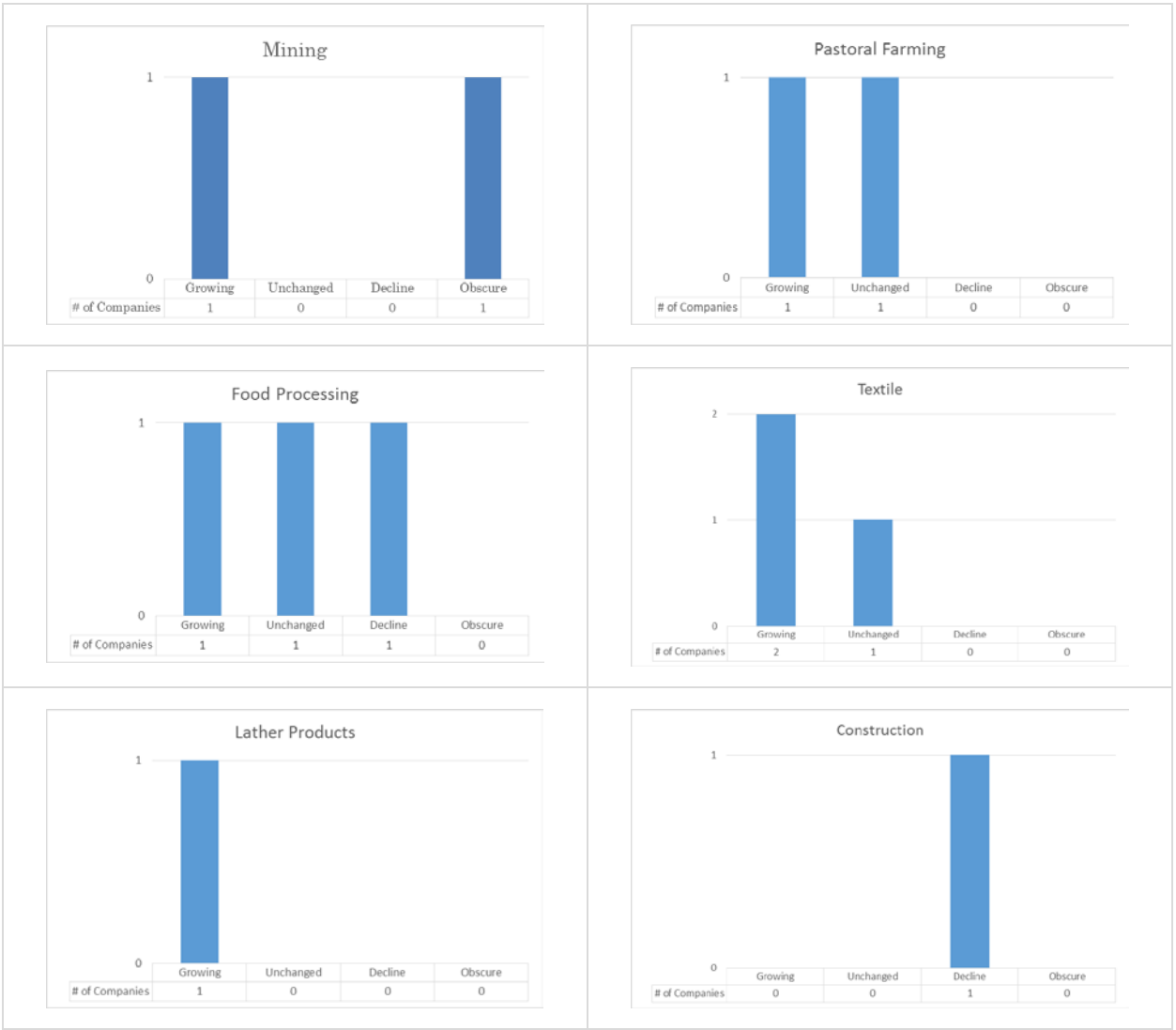
(Source: Processed by research team based on interview findings)

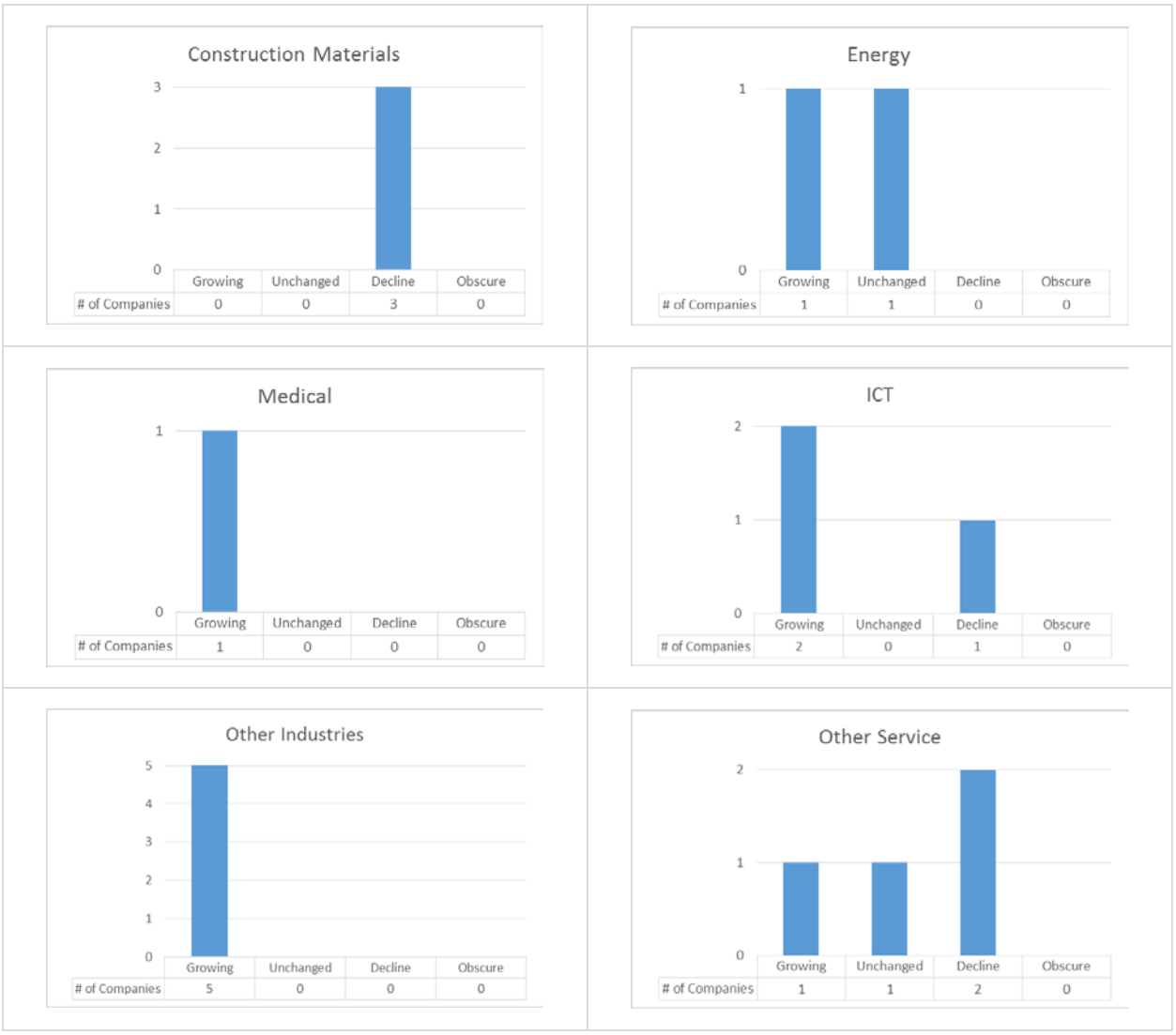
Figure. 2-5 Business Outlook by Every Stage of Industry

2) Business and Industry Outlook by Industry Type

Figure 2-6 shows business and industry outlook of establishments by each type of industry. Particularly, other industrial sector's (automotive parts, machinery parts, home furniture, pharmaceutical products, day-to-day needs items) 5 out of 5 companies have noted that they are growing while textile and leather industry also noted high growing outlook. ICT industry is growing as well.

On the other hand, strong impact of economic difficulty was seen in industries such as construction, construction materials and other service sectors. 1 out of 1 construction company, 3 out of 3 construction materials company, 2 out of 4 other service sector companies (education, repair, logistics, heavy equipment sales) noted that their business is declining. Many constructions were built during the period of economic growth; however, many construction jobs are currently being frozen shows the cold reality of the construction business situation.





(Source: Processed by research team based on interview findings)

Figure. 2-6 Business and Industry Outlook by Industry Type

2.3.3 Engineering Job Roles by Industry Type

(1) Classification of Occupations for Mongolian Industrial Sector

Mongolian industrial workforce was implemented YAMAT08 with the support of ILO as per International Standard Classification of Occupation 2008: ISCO08. According to YAMAT08, occupations are classified as following 10 group of classifications: ①Managers, ②Professionals, ③Technicians and Associate Professionals, ④Clerical support workers, ⑤Service and sales workers, ⑥Skilled agricultural, forestry, fishery workers, ⑦Craft and related trades workers ⑧Plant and machine operators and assemblers ⑨Elementary occupations ⑩Armed forces occupations and described detailed occupations for each classification.

Following table shows the classifications of occupations based on YAMAT08 for main industry sectors where survey-participated establishments operate.

Table. 2-2 Standard Classifications of Occupations for Main Industry Sectors

Type of industry	Professionals (Engineer)	Technicians and Associate Professionals (Technical worker)	Craft and related trades workers (Skilled worker)	Plant and machine operators and assemblers (Operator)	Elementary occupations (Unskilled worker)
Agriculture and livestock	Agricultural technician	Agricultural technician			Agriculture, livestock worker
Mining industry	Mining Technician Metallurgical Technician	Mining Technician Metallurgical Technician		Mining and mining machinery operators	Mine workers
Textile and garment industry	Machinery Technician Manufacturing Technician	Mechanical Engineering Technologist Production Controller	Mechanics and repairers, tailors, embroiderers	Textile machinery operators	Production workers
Leather industry	Machinery Technician Manufacturing Technician	Mechanical Engineering Technologist Production Controller	Fur skinner Shoe maker	Fur and leather machinery operators	Production workers
Food processing industry	Machinery Technician Manufacturing Technician	Mechanical Engineering Technologist Production Controller	Dairy products and food products maker, etc.	Food products manufacturing machine operator	Production workers
Construction material industry	Machinery Technician Manufacturing Technician	Mechanical Engineering Technologist Production Controller	Mechanics and repairers	Construction materials manufacturing machinery operators	Production workers
Construction industry	Architect, Civil Engineer	Construction Technician, Civil Technician	Carpenters, bricklayers, painters, etc.	Construction and grading machinery operators	Construction and grading workers
Energy/Power industry	Electrical engineer	Power plant operator	Electrical equipment installers and repairers		
Medical industry	Doctor, Nursing Specialist	Medical Assistant/Deputy Specialist, Nursing Assistant/Deputy Specialist			Assistant
IT	IT engineer	IT technician	Programmer	Programmer	

(Source: Processed by research team based on ISCO08)

As per informed by Ministry of Labor and Social Protection (hereinafter referred as MLSP) of Mongolia, directions being made to spend necessary amount of time to implement classification system of occupations based on YAMAT08 to all establishments in Mongolia and even combining the classification system of occupations to pensions and retirement benefits system as well. Although conclusions about engineering workforce in Mongolia will be made based on the survey interviews in the later stage, based on abovementioned YAMAT08 classifications, “professionals” refers to engineer and “technician” refers to technical worker.

"Craft and related trades workers" refer to skilled worker, "Operators and assemblers" referred as operators, but for Mongolia, particularly technicians of SMEs are often considered as skilled workers and operators. "Elementary occupations" is referred to as unskilled worker and can be generally called "worker".

(2) Job Roles of Engineer Based on Interview Survey

Table 2-3 shows job roles of engineer by industry type based on the interview survey.

Job roles of engineer differs depending on the industry type, however, common in terms of product development, quality control, process management, sanitation and safety management, machinery maintenance and technician's management. Depending on the industry type, research and development (agriculture and livestock, food processing, energy etc.) roles can be applied as well.

Table. 2-3 Engineer Job Roles based on Interview (by Industry Type)

Mining industry	Materials and metals research
	Mining plan
	Power, high-voltage power
	Heat and water supply
	Construction and road infrastructure construction
	Software
	Machinery operators
	Measurement
	Geology
	Machinery repair services
	Chemistry
	Weather
	Geotechnical engineer
	Air conditioning
	Managing technicians

Agriculture and livestock	Agriculture worker (breeding, pest control activities, measures and studies)
	Vegetable cultivation
	Greenhouse vegetable cultivation
	Machinery operators
	Research and development
	Production management
	Machinery repair services

Food processing industry	Process management
	Mechanics
	Machinery operators
	Quality control
	Research and product development
	Sanitary and safety control
	Manufacturing process design management
	Procurement costs management
	Preparation of technician

Textile and garment industry	Head of factory
	Production plan
	Process management
	Quality control
	Machinery repair services
	Managing technicians
	IT systems and software
	Human resource management
	Design

	Providing technical instruction for workers
	Raw material purchase and cost accounting

Leather industry	Head of factory

Construction	Develop, execute and monitor construction plan
	Develop materials plan
	Construction planning
	Construction management
	Materials management

Construction materials	Head of factory
	Quality control
	Process management
	Material order management
	Glass and laminating lines, operation
	Glass drying lines, operation
	Pneumatic welding
	Glass processing machinery, operation
	Electric welding

Energy/Power	Technology administrator
	Machinery operators
	Machinery repair services
	Managing technicians
	Mechanics
	Research and development

Medical	Medical equipment operators
	Medical equipment maintenance

ICT	Project manager
	Project coordinator
	Senior developer
	System analyst
	Designer
	System administrator
	Mobile developer
	Programmer
	Coding
	Computer installation ・repairs, services
	Office equipment installation ・repairs, services
	Automation system

	Telecommunications
	IT network
	Radio technology
	Computer technology
	Cyber technology
	Information system
	Database development
	Solid electronics
	Computer network

Other industrial sectors	Head of factory
	Production management
	Quality control
	Quality assurance
	Process management
	Machinery operators
	Machinery repair services
	Product development
	Quality and components check
	Sanitary management
	Product design

Other service sectors	Repair factory management
	Service supervisor
	Repair supervisor
	Sales and marketing
	Mechanics

(Source: Processed by research team based on interview findings)

Table 2-4 shows the description of job for engineer and technician, and their academic background according to the interview survey.

Table. 2-4 Summary of Duties, the Educational Background According to the Professional Ability of the Engineer and Technician of the Target Company

Job-class, professional ability	Duty	Remarks (Educational background)
Consultant/ Chief engineer （CE）	These consultant/chief engineer Professional ability in construction and civil industries An experienced project leader Engineer involved in the large-scale project, Multidisciplinary problem-solving skill In case of manufacturing industry, it is the duties of the plant manager	Bachelor and Master degree To acquire qualifications, it is necessary to pass the examination in the tenth year after three updates after acquiring PE (Update it every three years)

Job-class, professional ability	Duty	Remarks (Educational background)
Professional engineer: PE	Quality control manager, To analyze the raw material, to develop new product To supervise sanitary management and safety management To supervise an engineer	Bachelor and Master degree To qualify PE, it is necessary to pass an examination through business experience more than 5 years after graduating from University (Update it every three years)
Engineer	Process control manager, To find and solve the technical problems in each process To supervise technicians in each process To maintenance delicate machinery	University graduate
Technician	These technicians perform to support production management under the supervision of Engineer, as well as operating and maintain machine.	Technical College graduate, and TVET graduate
Skilled worker	These skilled workers perform in following (Metal processing, Welding, Carpentry, Painting, electricity, Water management, Gas delivery services etc.) as well as operating the machines. However, in the Mongolian companies, the role of these skilled workers are difficult to be differentiated from the technician.	Technical College graduate, and TVET graduate
Unskilled worker	These unskilled workers perform in various simple tasks under the supervision of Technician and Skilled workers.	Junior high school graduate, high-school graduate

(Source: Processed by research team based on interview)

Difference by a Scale, the Form of the Company

According to the result of interview survey, large-scale company and state-owned company distinguish job duty between engineer and technician clearly in connection with academic record. On the other hand, a small and medium-sized company seem not to distinguish the job duty between them, and to assign a job in reference to the professional ability and business experience. Even if the person graduated from University, it has a way of starting job as operator and worker. In case of large-scale company such as a state-owned company, they have manage working staff in accordance with occupation classification of YAMAT08.

In case of foreign companies or joint companies with foreign companies, these companies value the ability of communication skill and linguistic talent on engineer. However, there are a few human resources which meet the needs of these companies. In addition, Mongolian companies which have ambition to develop overseas market also require engineer to acquire linguistic talent and to develop new product. In addition, Mongolian companies which have ambition to develop overseas market also demand that the engineers should acquire linguistic talent and product development skill.

2.3.4 Personnel Assessment

(1) Overview

This survey was conducted to evaluate the human resource who graduate from higher education including University (undergraduate course and postgraduate course) and Technical Vocational Education and Training (TVET) by type of business. Although Kosen Technical College is also one of higher education, Kosen Technical College was eliminated from investigation object. Because that Kosen Technical College has not produced graduates in this survey period.

Common issues which graduates of higher education inherent in is a vulnerability of practical skill. There are some reasons behind this issue. First, curriculum and educational materials which used in higher education have relatively become older than world standard. Second, there are a few advanced equipment which industry sector applying in the universities. In addition, academic personnel does not figure out actual business condition based on international standard. These situations caused the vulnerability of practical skill for the student who study in higher education organization. Therefore, industrial sector has gauged that the graduates from higher education organization are not industrial-ready. Mongolian companies hire experienced staff preferentially. It is quite different between Japanese and Mongolian companies. Japanese company has a custom to employ new graduates and train them by their own training system in the company.

Secondary, there are a lot of opinions that higher education cannot cultivate the student who acquire communication skill and spirit of teamwork. Consequently, it is pointed out that companies should give training on basic communication skills to their staff. Additionally, there are opinions from the companies that the graduate from higher education are less- creative. Although the graduates from higher education can work possibly in accordance with manual and instructions, they cannot work positively with the spirit of self-development.

On the other hand, the companies evaluated that the graduates from Technical College and TVET acquired a practical skill with certain level. However, they received feedback that that they obtained specialized knowledge and theory insufficiently from the company. In addition, there are some opinion that the graduate from Technical College and TVET cannot work at the same working place continuously and they have low motivation to working.

(2) Evaluation on the Industrial Human Resource

As for the industrial human resources in the mining engineering field, engineers working in that field have a shortage of specialized knowledge such as high voltage engineering and geology for the underground mining and open-pit mining. Furthermore, generally speaking, it is evaluated that communication skills such as presentation and report writing skill and data analysis ability are insufficient. In addition, a foreign-financed mining company pointed out the lack of English skills for business communication of the staff working in the company.

As for the need of human resources in agriculture and stock farming field, there is high demand to cultivate the agronomist and biologist who can develop breeding and cultivation due to the Mongolian government's policy to increase the self-sufficiency in agricultural crops. According to the result on interview survey, human resource of agronomist and biologist is almost successfully to be developed. On the other hand, it is pointed out

by companies that the workers cannot operate the machines as planned, because of the decrease in the educational quality in higher education organization.

As for the need of human resources in food processing field, the company evaluated that the person working in the field has a lack of specialized knowledge about blending and purification methods in order to develop the new market by developing new product. In this filed, there can be found little industrial-university collaboration. Therefore, the person who studies about food processing in higher education cannot meet the practical skill which the company required.

Regarding the engineer in textile field, there is survey result that the engineer cannot operate a modern machine in the process of filature, weave and dye. Therefore, it is necessary to train the staff for long-term in the company, and consequently to raise the cost to bring up human resource in the company. A major textile company has a comment that it has no engineer who can maintain the machine.

Due to sluggish economic conditions in Mongolia, the construction industry is also in stagnant situation. Therefore, it becomes to be difficult to learn project management under the large-scale project. Although construction engineer can qualify professional engineer through business experience more than 5 years after graduation of university, most of professional engineer cannot manage the project adequately. Therefore, it is said that retraining is necessary.

As for the situation of human resource in building material field, engineer who graduated from the department of material science in Mongolian University of Science and Technology has specialized knowledge of concrete. However, that engineer has a lack of analytical skill. Glass manufacturer pointed out that that new graduate from higher education organization has low practical skill due to insufficient educational facilities in University.

Regarding the engineer in energy industry field, the company takes priority to hire experienced engineer. The company basically does not expect new graduate as an industry-ready. Regarding the engineer in energy industry field, the company take priority to hire an experienced engineer. The company basically does not expect new graduate as an industry-ready. In the field of renewable energy, Mongolian University of Science and Technology and technical college located at Darkhan offer the educational program. However, the graduates from those have a lack of practical skill due to the insufficient educational facilities in higher education organizations.

Regarding the human resource in ICT filed, the graduates from the department of Information and Telecommunication Technology in Mongolian University of Science and Technology undergo an assessment from ICT industrial sectors. However, software engineer has a lack of fundamental knowledge about software design. In addition, some ICT companies set out to accept an order of business process outsourcing and software development from overseas companies. However, the company has few human resource who obtain foreign linguistic talent.

Table. 2-5 The Evaluation of Human Resources of the Graduates based on their Educational Attainment Level and Vocational Skill Training Institutions

Mining Industry

Overall evaluation	Experienced workers are prioritized compared to the fresh graduates when hiring
	Poor foreign language communication skills
	Lack of practical knowledge and learning opportunities to develop teamwork skills
Undergraduate graduates	Lack of learning opportunities about the latest steel mill machinery in universities
	Lack of learning opportunity about the latest geology and mining software
	Low level of education on steel framing design
	Lack of professional, communication skills (presentation & report writing skills etc.) and data analytics skills
	There are no universities that teach about high voltage electricity
	Relies upon the old Russian curriculum and falls behind in the process
Technical College graduates	Technical College graduates have sufficient practical skills but lack of theoratical knowledge including poor problem solving skills
	During the Socialist Era in Russia , *technicom*[19] graduates were employed after graduation, undergoing training and thus have a high level of practical skills

Agriculture and Livestock Industry

Undergraduate graduates	Univesity students undergo onsite practical training starting during their Second year. Long-term onsite practical training takes place during the Fourth year; allowing the students to acquire sufficient practical skills expected to accomodate the work-force needs.
	The quality of university education is declining. Some are unable to operate machines and equpments according to the instructions stated in the manual.
	The old curriculum of the socialism era is still being used.
	Poor educational level of educators
	Lack of opportunities in acquiring onsite practical skills
TVET graduates	TVET graduates incharge for developing strawberry jam as well as providing guidances to other employees.
	As TVET graduates are experienced with operating the machines, they have been given responsibility to operate machines and equipment as well as providing guidance to other employees.

Food Processing

Overall evaluation	Experienced workers are prioritized compared to the fresh graduates when hiring

[19] *Technicom* refers to a vocational education institution in the period of Socialism where it qualifies middle school graduates to enroll and the students will undergo vocational training for 4 year.

	Lack of practical skills
	During the Socialist Era, *technicom* graduates were employed after graduation, undergoing training in Russion after gaining onsite experiences in factories. They will be promoted to Engineers level having gained the experiences.
Undergraduate graduates	Have limited general knowldge about food technology, unable to learn the specific contents in-depth, hence, lacking specific knolwledge.
	The business-education cooperative learning content is not tallied.
	Human resources that can accommodates expectations
	High-expertise, career-oriented to be employed for long period.
	Food technology graduates from top 5 universities are hired. Each employee will first start as an operator.
Technical College graduates	Able to complete tasks according to the manual.
	Lack of positive learning attitude, enthusiasms as well as originality and creative thinking skills
	Lack of specific theoretical knowledge

Textiles

Overall evaluation	Experienced workers are prioritized compared to the fresh graduates when hiring
Undergraduate graduates	Lack of learning opportunities about the latest machines, hence, lack of practical skills.
	There are no human resources available; who are able to both maintain and operate the machines.

Leather

Overall evaluation	Since there is no vocational education institution that offers leather processing course, the training takes place in the hiring company.
	Takes 3 to 5 years to become skilled employees.

Construction

Undergraduate undergraduates	Sufficient theoratical knowledge but lack of practical skills
	There are many qualified Professional Engineers where most of them are not qualified enough for project management, thus, there is a need for reeducation and retraining.
TVET undergraduates	Sufficient skills but lack of theoretical knowledge

Construction Material

Undergraduate undergraduates	The expertise and the knowledge possessed by the Materials Engineering Graduates from the Mongolian University of Science and Technology (MUST) accommodate the needs and requirements of the Manufacturing industry where knowledge on concrete is necessary.
	The curriculum set by the university is unable to catch up with the latest technology available, hence, the lack of practical skills.
Technical College undergraduates	Sufficient knowledge but poor technical skills thus there is a need to reeducation and retraining. Unable to learn in adapting to the new environment.

TVET undergraduates	TVET graduates consist of those who are unable to pursue their higher education studies in universities lacking motivation and enthusiasm.

Energy

Overall evaluation	Experienced workers are prioritized compared to the fresh graduates when hiring
	Graduates of the Mongolian University of Science and Technology (MUST) and Darkhan Technical College have advantageous.
	There are a few university graduates who have low skills compared to the TVET graduates; depending on the individual.
	The graduates from Darkhan Technical College possess higher practical skills compared to the university graduates and their theoretical knowledge as good as the university graduates.
Graduate (master) graduates	Renewable energy is being taught mostly in the graduate school than in the undergraduate level.
Undergraduate (bachelor) graduates	Due to the poor maintenance of the machines and equipment which lead to the declining opportunities for practical training thus limiting their practical skills.

Medicine

Undergraduate graduates	Machinery graduates from medical universities are immediate asset to the firm.

ICT (Information, Computer & Technology)

Undergraduate graduates	Problems on communication skills and teamwork.
	Lack of developing skills
	The University's curriculum allocates more time on the academic, thus limiting time for practical training.
	University graduates are not expected to be immediately effective. The graduates will be trained in hiring companies.
	University graduates lack basic skills on computer software, English communication skills as well as inadequate knowledge on professional working ethics.
	Network maintenance personnel from MUST's telecommunication school are being employed

Other Manufacturing Industry

Overall evaluation	Due to lack of practical skills, each employee starts as an operator.
	Due to the lack of learning opportunities on the latest machines, there is the need to train each employee using the on-the-job training (OJT) practice.
Undergraduate graduates	Solid theoretical knowledge but poor machines operating skills
	High-qualified carpentry graduates from the Mongolian University of Science and Technology (MUST)
TVET graduates	Low level of motivation and propensity to disregard company's rules and regulations. Tendency to quit in short term.

Other services

Overall evaluation	Lack of language skills
	Lack of technical education
Undergraduate graduates	Students will only be taught theoretical knowledge without the practical training in the university and later will be trained in the hiring companies.
	The Railway department graduates of the Institute of Transportation have undergone practical training in the university.
	The university graduates do not possess the necessary practical skills such as car repairing skills particularly in terms of electrical system repair.
	The University graduates are fully equipped with the theoretical knowledge but lacking practical skills
	Educational content is out-of-date.
Technical College graduates	There is little to no difference between Technical College and High School. Graduates from both Technical College and High School often do not recognize the automotive parts and its functions. It is in such a state where nothing can be done. The graduates will undergo on-the-job training (OJT) in the hiring companies.
MCYT (TVET) graduates	TVET used to take 3.5 years of training until completion but have been shortened to 2.5 years, leading to the declining workforce quality.

2.3.5 Future Demands for Engineers

(1) Demands of Employment in Three Industrial Sectors

We survey recruiting policies of three industrial sectors which we found through the interview sessions with companies, classifying the answers from the companies into ‘positive forecast’, ‘preservation of status quo’, ‘reduction’ and ‘unclear’.

As a whole, out of all 30 companies, 12 companies (40 percent) answer positive forecast, 17 (57 percent) answer preservation of status quo, one (three percent) answer unclear.

Although being in the recent sluggish economic situation, the answers of preservation of status quo are found the most followed the answers of positive forecast; the answer of reduction none and the answer of unclear only one.

As to companies in the primary industry, though the number of companies is small, we note that out of four companies, three give positive forecast and one company preservation of status quo. As to companies in the secondary industry, out of 18 companies, seven companies (44 percent) give positive forecast and nine companies (56 percent) preservation of status quo. Whereas, regarding companies in the tertiary industry, out of 10 companies, only two companies (20 percent) give positive forecast; seven companies (70 percent) preservation of status quo and one company answers unclear.

(Source: Processed by research team based on interview findings)

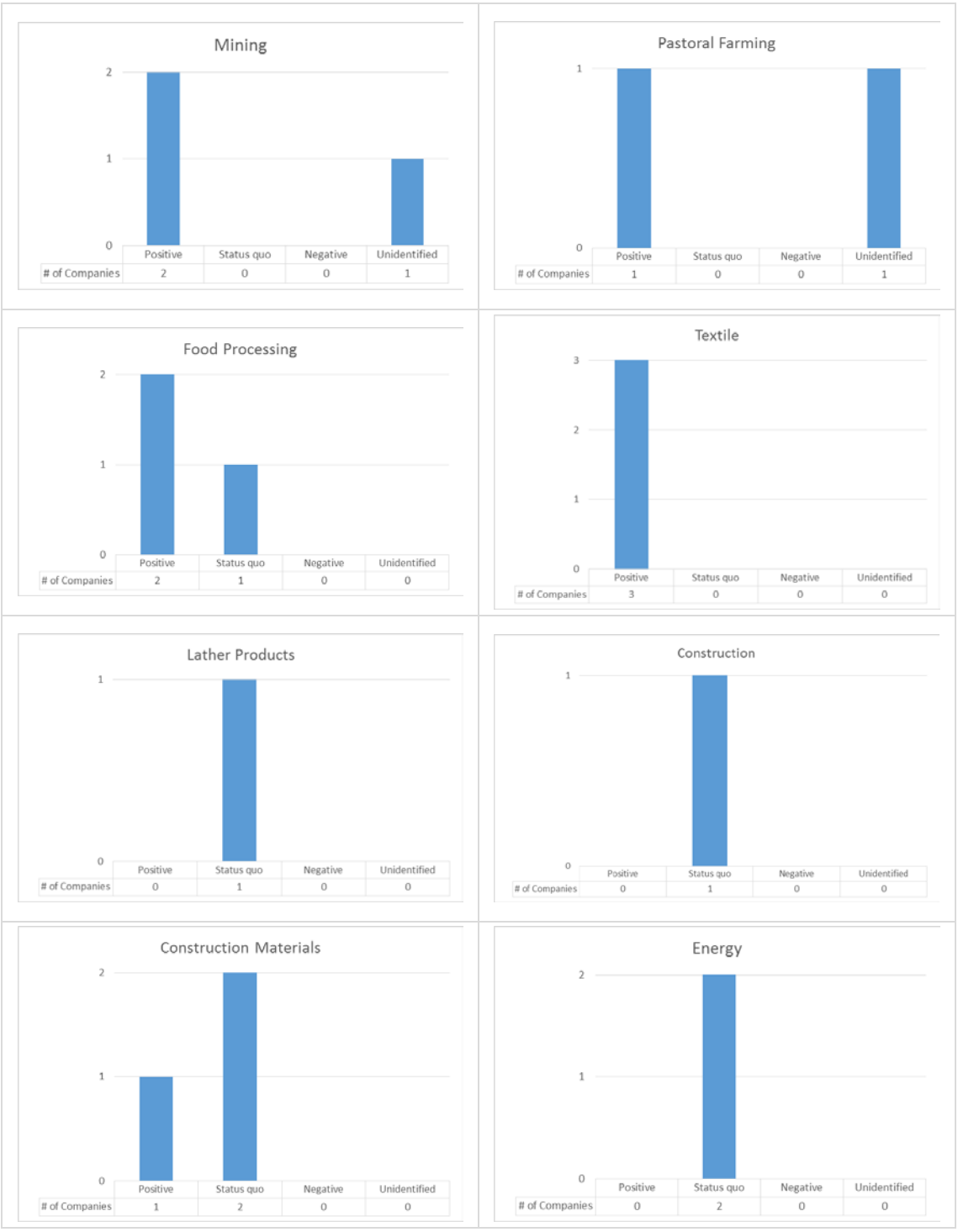
Figure. 2-7 The Needs on Industrial Sectors

(2) Demands for Engineers among Industries

In this section, we survey demands for engineers according to the type of business we found through the interview sessions with companies.

We found that the mining industry, the food-processing industry, the textile industry, medical industry are currently keen for employment; the construction industry, the construction material industry and the service industry have non-positive policy for employment with many companies answering preservation of status. In the manufacturing industry, demand for mechanical engineers is high.

Basically, we observe that there is a tendency for growing companies in terms of business and industry to have positive policy about employment; even companies in stagnant business circumstances, which are on the way going out from the worst situation, have employment policy of preservation of status quo (not reducing employment). We note however that job separation rate is in general high and there are a lot of companies which answer that they refill posts of separated employees to maintain the labor force.


Mining
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Pastoral Farming
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Food Processing
Positive
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2
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Textile
Positive
Status quo
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3
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Lather Products
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Construction
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Construction Materials
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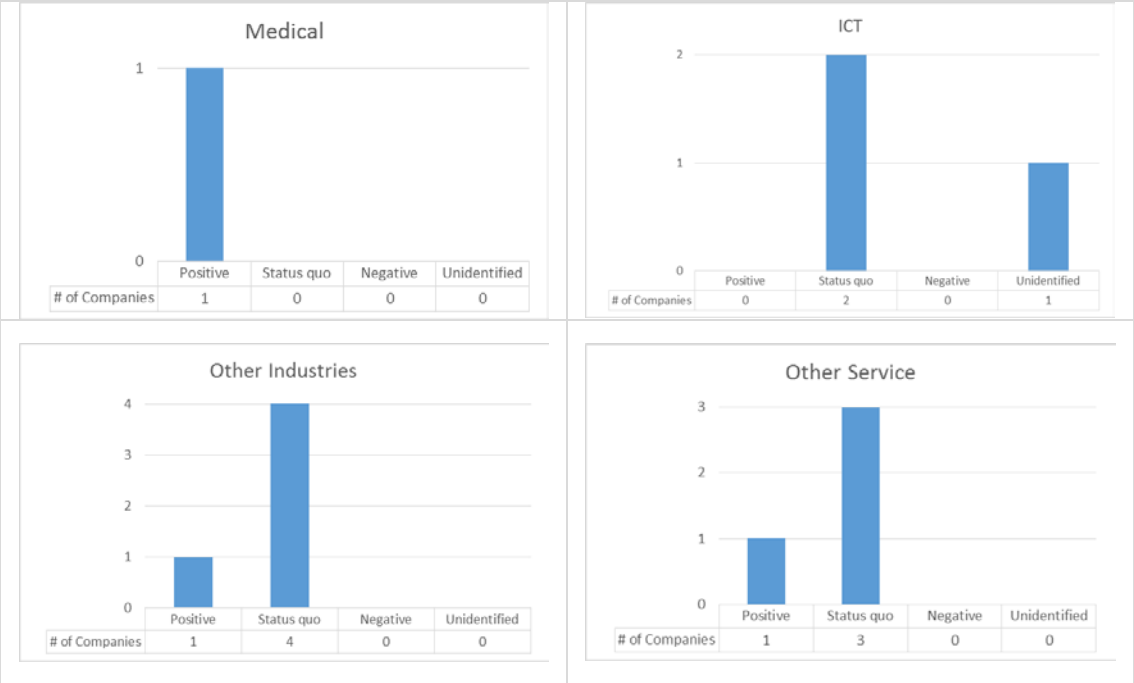


(Source: Processed by research team based on interview findings)

Figure. 2-8 The Needs of Engineers among Industries

(3) Method of the Human Resource Development

As previously mentioned, companies surveyed preferentially employ practical and experienced person. Mongolian companies do not put a personnel strategy same as that of Japanese companies. Personnel strategy of Japanese companies employs new graduates and provide them with training in corporation. However, most of Mongolian companies adopt "Mentor system" – the system such that experienced engineers instruct new graduates one to one during the probationary employment period during 6 months to 1 year. After the probationary employment period, new graduates get a permanent job.

Human resource development is mainly conducted by on-the-job training (OJT). Human resource development on engineer become configurational structure that senior engineer such as Consultant Engineer and Professional Engineer supervise and instruct (junior) engineer, and (junior) engineer supervise and instruct technician.

Other training system except for OJT are internal and external training program. Internal training program is conducted by the professional ability. Concretely speaking, a rating system giving 1 to 5 year in accordance with professional skills was established in the company. Practical training is conducted in order to improve their professional skill. As for the external training program, supervisory authorities and industry group conduct a training program.

The feature of human resource development categorized by the industrial fields are as following.

As for the human resource development of architecture and civil engineering, it is highly required to acquire a project management skill for young engineer and mid-level engineer. Mongolian University of Science and Technology and Association of professional consultant provide training course to qualify professional engineer and consultant engineer. As for the human resource development of technician, Architectural Development

Center cultivate a carpenter and a painter by the program in combination with lecture and practical training. After confirming the practical skill, the certification equivalent to the certificate provided by TVET is issued by the center.

Regarding the human resource in ICT field, the company requires ICT engineer to obtain the certification which approved by global software enterprises such as Microsoft, Oracle, Cisco. Therefore, the company send the person in charge of ICT to the training organization specialized in ICT. Some of big companies train ICT engineer by establishing the institute specializes in ICT in their own company.

In case of the human resource development in foreign companies, the company dispatch the engineer and technician to home country in order to train them. In case of Japanese-affiliated company, the company dispatch prospective engineer to Japan for 2-3 years, and bring up to experienced engineer. After coming back to Mongolia, experienced engineer engage in advanced work, and instruct young engineer.

2.3.6 Future Technical Development Needs for Engineer

As it has been mentioned in 1.2 “Important area for national development plan”, the Government of Mongolia has formulated Vision 2030 and aimed for developing environmentally friendly technology and democratic & transparent governance system as well as diversifying of industries from traditional dependence on commodity of mining, agricultural and livestock sectors to making higher value addition and productivity through technical innovation. In addition, in order to achieve the above mentioned target, in particular, introduction of advanced technology for development of such industries as agriculture & livestock, manufacturing sector-food processing, textile & garment, leather, construction material, processing of mining products-, energy, infrastructure and ICT and nurturing of highly professional engineers of the above industries, are greatly needed.

According to the interview survey, the JICA Study Team has summarized concrete technical development needs for engineers in major industries-including the above sectors- in the table below.

Table. 2-6 Technical Development Needs for Engineers in Major Industries

Sector	Technical Development Needs (knowledge and skill gap)	Remarks
Mining	・ Latest software knowledge and skill for geology ・ Technical knowledge for high-tension electricity ・ Underground mining (geotechnique, mining plan, etc.) ・ Mine blasting	
Agriculture & Livestock	・ Improvement of bleeding and cultivation technology ・ Knowledge and skill of bioengineering	
Food Processing	・ Knowledge of blending ingredients and production ・ Knowledge of diary product ・ Knowledge and experience of product development	・ Meat processing ・ Production of diary product
Textile & Leather	・ Knowledge and skill for maintenance and operation of machinery ・ Knowledge and experience for programmed machinery ・ Knowledge of material	
Construction Material	・ Analytical skill for composition and strength of construction material ・ Knowledge and experience for research & development of new technology through industry-university cooperation	・ Cement production
Energy	・ Knowledge and skill for equipment- power generator, etc.- of renewable energy as solar, wind, geothermal and bio	・ Renewable energy

ICT	・ Knowledge and skill for programming language-Java, etc.- ・ Skill of development contribution for Open Source Software such as Linux ・ Knowledge and skill as system analyst to bring solution to customers' operational problems（broad knowledge as management, marketing and finance is required）	・ Software

（Source: JICA Study Team based on interview survey）

2.3.7 Expectation for Higher Education Institutions

Firstly the common expectation for development of engineer's capacity for all industries in the interview survey is education to nurture practical skill. As it has been mentioned above, educational content has not caught up with fast-evolving industries' need and most institutions have still been using outdated curriculum and educational material, they are urgently required improving the content in accordance with present international standard. In particular, many interviewees have pointed out that as equipment for practical work is obsolete and students cannot acquire knowledge and skill of machinery currently used in industries, such equipment need to be immediately renewed. In addition, since the curriculum of university education is too much biased toward theory, there is strong request to have more balanced proportion between theory and practice as to 1:1. In this regard, in order to implement practical curriculum in accordance with industry's need, universities should recruit academic with more practical background and nurture their knowledge and skill.

Secondly, it can be pointed out high expectation for developing teamwork and communication skill. Since graduates of higher education institutions are said to have insufficient attitudes for collaborating as a team, cooperating each other to solve problems for improving productivity and quality, they should be provided training for problem analysis and solving through practical work by group. Besides, particularly foreign companies and ICT companies pointed out the need for improving foreign language communication skill in engineering departments as their graduates' communication level is low.

Thirdly, manufacturing companies that plan to expand new market and strengthen competition require industry-university cooperation or industry-government research institution cooperation be strengthened. According to them, as Mongolian universities concentrate on basic research and applied technical research even in government research institutions is rather weak, strengthening industry-university cooperation is crucial to make product development through technical innovation in the future. Although some cases such as Institute of Transportation and state owned Mongolia Railway Company show that industry's need and educational curriculum closely link each other, they have not reached the level of applied technical research.

Finally, it should be also noted that some interviewees of senior management who have observed transition from socialism to capitalism economy, have expressed opinion that Mongolia should establish higher education institution to nurture practical professional engineers by re-evaluating engineers who was educated in Technicom in socialism era in order to complement university's engineering education that is too much biased to theory.

2.3.8 Summary

In this section, as a summary of the interview survey, engineer's job duty, skill gap, and future technical development needs and expectation for higher education institutions, are briefly described as follows.

Job Duty

The engineer's job duty is generally defined as production development, quality management, production management, sanitary & safety control, and supervision of technician, etc. Particularly, as far as production management is concerned, identification of problems in each production process and their solutions is a critical role for engineer. In addition, engineers in some industry such as agriculture & livestock, food processing and energy are responsible for research and development. On the other hand, technicians in general, are responsible for operation and maintenance of machinery and some skilled works (e.g. metal processing, electric/gas weld, paint application, electric/water supply/gas service works, etc.).

Skill Gap

University graduates are to some extent familiar with engineering theory, but since they have no experience for practicing with latest machinery, they have not acquired practical skills. Besides, in university, as practical work's time is limited, skill for problem analysis and solution is not properly educated. Therefore, industry side has to invest much time and money for training new university graduates by making them experience from workers and/or operators.

On the other hand, as far as graduates of TVET and Technical College are concerned, while their practical skill is appreciated to some extent, most interviewees point out of their theoretical weakness. However, it is also indicated that level for industry-ready recruits is low because their training is based on old and obsolete equipment. In addition, concerning professional ethics, it is said that they cannot work for a long period of time in one company due to rather low motivation toward work.

Furthermore, most of the interviewees have pointed out that communication skill, teamwork skill and self –development mind are not properly educated in higher education institutions for engineering and technology human resource.

Future Technical Development Needs

In general, in spite of some difference of specific knowledge and skills according to one industry to another, there is strong need for creative and practical engineer who can engage in new product development, quality control and production management based on technical innovation with originality and ingenuity. Particularly export oriented manufacturing industry such as food processing, leather, textile & garment; strongly require such engineers as to contribute to improvement of quality of products and to development of new products with knowledge and operational experience of latest machinery.

Furthermore, regardless of industry, it is widely pointed out that engineers need to nurture capacity of solving problems of production & quality management and thereby contributing to improvement of productivity and quality through analysis of various data. In this regard, as it has been mentioned above, teamwork and communication skill as well as analysis and solution skill should be enhanced through practical group work.

Expectation for Higher Education Institutions

The most critical expectation for higher education from industry side is to education which enables graduates to acquire practical skills. As educational content has not caught up with ever-evolving industry's

needs, it is urgently required to develop curriculum based on international standard and to renew equipment for practical work.

In addition, as the graduates have not acquired sufficient teamwork and communication skill, it is required for nurturing such skills through group work. Besides improving English communication skill in universities is also needed.

Furthermore, especially manufacturing companies need further strengthening of industry-university cooperation in order to promote new product development by technical innovation through strengthening applied technology research.

In short, it can be concluded that from industry's point of view, higher education institutions in Mongolia need to educate students for potential engineers with well-balanced program of latest theory and practical group work.

2.4 A Survey on the Condition of Elderly Care Facilities

2.4.1 Survey Purpose

We received a request from the MLSP of Mongolia, to include nursing personnel in the elderly care sector as survey target in the survey on industrial human resources needs. Upon the request, we have conducted field interview survey at relevant facilities, institutions, and organizations in order to understand the actual situation focused on nursing personnel in elderly care facilities. At the same time, we also examined training needs for construction engineering talents in higher education institutions who will contribute to solution of the problem through understanding issues on facilities and equipment aspect.

2.4.2 Survey Method

In the field survey of December 2016, we conducted interview survey by visiting representative elderly care facilities near Ulaanbaatar city. The target elderly care facilities and the scheduled dates for the interview are shown in Table 2-7. All subjects are residential facilities.

"National Elderly Care Development Center" (the only government run elderly care facility near Ulaanbaatar city) and three other private facilities were selected as survey targets for comparative study. Out of the three private facilities, two facilities are operated by international NGOs and one facility is operated by a local NGO.

Table. 2-7 Survey Schedule for Elderly Care Facilities

Survey date	Facility name	The person in charge	Parent organization	Location
2016/12/12	National Elderly Care Development Center	・Director of the center ・Service and maintenance manager ・Social worker	Government	Tuv province
2016/12/12	"Missionaries of Charity Mongolia" Bayankhoshuu center	・Chief administrator and social worker	International NGO	Ulaanbaatar city
2016/12/13	"Missionaries of Charity Mongolia" Yaarmag center	・Social worker	International NGO	

2016/12/13	NGO "Batgerelt-Ireedui" Disability care center	・Chief administrator	Domestic NGO	

In addition, in the field survey of December 2016, we included interview surveys of the related government agencies and private organizations as following schedule. Survey schedule is as shown in Table 2-8.

Table. 2-8 Survey Schedule for Elderly Care Field Related Government Agencies and Private Organizations

Survey date	The place visited	The person in charge	Location
2016/12/13	NGO "Universal Progress" Independent living center	・Representative	Ulaanbaatar city
2016/12/23	Ministry of Labor and Social Protection Social Welfare Service Department Social Welfare Service Division	・Expert	
2016/12/27	Ulaanbaatar city Social Welfare Service Department	・Deputy Director ・Expert in charge of elderly ・Expert in charge of disabled people	

2.4.3 Survey Results

Based on the results of the interview survey, we made general outline of the situation and problems facing each elderly care facility.

(1) National Elderly Care Development Center

1) Facility Overview

① Establishment

Founded in 1925. In 1967 it was relocated from Tsenkhermandal soum of Khentii province to current Batsumber soum of Tuv province. Tuv province is adjacent to Ulaanbaatar city.

② Operating Entity

It is the only national elderly care facility located near Ulaanbaatar city. It is run by the Labor and Social Welfare Service Administration Affairs Department under the MLSP, and operates its activities based on social welfare law as a basis.

③ Target Residents

The scope of residents is elderly and disabled people who are in need of constant medical and nursing care as they lack self-reliance skills and relatives to take care of them.

④ Mission

The mission of the Center is to enrich the daily living environment through provision of meals, clothing, medical and nursing care services, as well as cultural and psychological support.

⑤ Number of Beds

200 beds. 80 beds were added in 2015.

⑥ Number of Staff

Staff placement - 103 people. Among them, 2 doctors, 2 associate doctors, 4 nurses, 1 psychologist and 1 social worker. Approximately 90% of the staff come from the local Tuv province.

⑦ Number of Residents

Residents are 126 elderly people (women aged 55 and older, men aged 60 and older), 74 men and 52 women. 35 residents are in a state close to the bedridden therefore are in need of nursing care. Nearly 90% of residents have some difficulties such as language and hearing disabilities, brain function injury, cerebral palsy, psychiatric disorder, lower limb dysfunction, visual impairment, etc. 70% of residents are from Ulaanbaatar City, and 30% are from other provinces.

2) Cooperation with Overseas Institutions

A number of KOICA volunteers were dispatched to the center till 2014. However, since 2014, even though the center submitted a dispatch application, it has not received any volunteers. Also, they have a track record of receiving rehabilitation equipment support from Korea and Japan.

Furthermore, an agreement between the center and the M-Link Holdings group of Japan was made in August 2016. The agreement has three main related to personnel exchange, facility construction, and others. This agreement was initiated when the group visited the center during their visit to Mongolia in the spring of 2015.

3) Issues Facing the Facility

Issues on Human Resource Development

Human resource development is highly necessary. Staff are engaged in work based on their own creative ingenuity, but they need opportunities to learn from advanced countries in the nursing care field like Japan. If there are opportunities such as training in Mongolia or training in Japan, temporary staff can be hired while a full time staff is attending professional development program. Also, from the perspective of human resource development, the need to dispatch of overseas volunteer is high.

Issues on Hardware Aspect

- Transportation access: No paved roads to the center and there is unpaved road of about 7 km. As the road freezes, it is relatively easy to drive in winter time, but when snow melts in spring, it gets muddy and difficult to drive a car.
- Laundry facility: There used to be an outdoor laundry facility before, but after the inspection by a government agency, its use was stopped because it didn't meet the standards. Currently, washing machines are installed in one room indoors, and operate for 24 hours.
- Staff dormitory: Currently there are many local staff. If staff dormitory is upgraded, more staff from Ulaanbaatar city could come to work thus the quality of service could see improvement. The management have already submitted a request for building a 24-staff dormitory to the ministries concerned, but haven't got an answer yet. The land is already obtained, and the center staff have managed to arrange a dormitory for five people on their own so far, but it is still not enough. In order to make receive volunteers from overseas such as Korea and Japan, it is necessary to build a staff dormitory.

- Sewage treatment facility: Requested the government, but haven't received a reply. A sewage treatment facility of the newly constructed sanatorium in the neighboring area in 2015 cost 200 million tugrug. For building a sewage treatment facility at the center, more costs can be expected.
- Rollaway beds: Rollaway beds are also necessary for prevention such as bed sores for residents in bedridden condition.
- Rehabilitation equipment: Received equipment under the support of Korea and Japan, but it is insufficient.

(2) "Missionaries of Charity Mongolia" Bayankhoshuu center

1) Facility Overview

① Establishment

Bayankhoshuu center has started its activities since 2011.

② Operating Entity

Missionaries of Charity Mongolia

③ Target Residents

The scope of residents is poorest elderly women with the highest support needs. Some residents don't have relatives to take care of them and some of them have no identification documents.

④ Mission

To provide homely nursing care services for the elderly who are poor and with the highest support needs.

⑤ Number of Beds

25 beds.

⑥ Number of Staff

Staff placement - 15 people. Among them, 1 nurse and 1 social worker. In addition to 11 Mongolian staff, there are 4 sisters (India, Korea, Philippines, Bangladesh) are placed from Missionaries of Charity.

⑦ Number of Residents

Resident capacity is 25 people. Because there are many prospective residents, the center is planning to improve the indoor environment to increase the number of residents by 5 and allow a total of 30 people to be accepted.

⑧ Others

- The building of the center is a private house which is purchased and then renovated.
- In Mongolia, there are a total of 3 centers in Bayankhoshuu district, Yaarmag district in Ulaanbaatar city and Darkhan city of Darkhan-Uul province.
- In addition to nursing care services for the elderly, the center is also working on income improvement support, such as opening sewing classes for local residents.
- Don't charge fees from residents.
- Regarding cooperation system with medical institutions, the center cooperates with family physician in the district area.

2) Cooperation with Overseas Institutions

The center has a track record of receiving support of facility and equipment repair from German companies in Mongolia.

3) Issues Facing the Facility

Issues on Human Resource Development

11 Mongolian staffs are also short of knowledge, experience, and expertise, and the needs of participation in training is high.

Issues on Hardware Aspect

- Facility environment: Residents and prospective residents exceeded the capacity, and the room area per resident is getting narrower. As one solution to this problem, it is considered that if the center can receive support for providing ger for sewing machine classes, the center use it as a ger sewing classroom and accept the more residents by filling the present sewing machine classroom space as residential space.
- Facility: Nursing Care Welfare Tools/ Equipment: In addition to special tools and equipment, there are also shortages of normal chairs and desks. There are no rollaway beds.

Issues on Institutional Aspect

There is a problem in acquiring identification documents. Some residents don't possess identification documents. Staffs, including social workers, are supporting the acquisition of documents, but they face difficulties. To obtain the documents, it takes at least 3 or 4 months. In some cases, it took 5 years. Besides that, there are cases in which tooth cell checks are performed to specify the age of residents, and court intervention is required, which become an issue.

(3) "Missionaries of Charity Mongolia" Yaarmag center

1) Facility overview

① Establishment

The center has started its activities since 2002. The building of the center is an old private house which is purchased and then renovated. At the beginning of 2002, capacity of resident was 10 people. Some extensions were made in 2015.

② Operating Entity

Missionaries of Charity Mongolia

③ Target Residents

The scope of residents is an elderly men located in the poorest with the highest support needs. Some residents don't have relatives to take care of them and some of them have no identification documents.

④ Mission

Provides homely nursing care services for the elderly who are located in the poorest with the highest needs support needs.

⑤ Number of Beds

25 beds.

⑥ Number of Staff

Staff placement - 11 people. Among them, 1 social worker is professional. In addition to 7 Mongolia staffs, there are 4 sisters are placed from Missionaries of Charity.

⑦ Number of Residents

Resident capacity is 25 people, but prospective residents are exceeded. Age of residents is currently 54 to 80.

⑧ Others

- Basically, the center doesn't charge fees from residents. However, from 2016, there are cases in which cost of tooth treatment is charged from residents' pensions.
- Regarding cooperation system with medical institutions, the center cooperates with family physician in the district area.
- In addition to nursing care services for the elderly, the center has been doing weekend cooking, providing clothing, medicines, etc. for local poor residents.

2) Issues Facing the Facility

Issues on human Resource Development

Short of professionals. There are needs for external training, but opportunities and budgets are short. Also, the educational system for nursing care human resource development is not in place, which leads to the shortage of professionals.

Issues on Hardware Aspect

- Facility environment: Residents exceeded its capacity and the capacity of the facility is facing the limit. Also, there is no space or room where residents can do exercises or sports. Land extension application has been submitted to the Khan-Uul district, but haven't got an answer yet.
- The space of the toilet facility is narrow, and renovation work is planned in the spring of 2017.
- Rehabilitation instruments and equipment are in shortage.

(4) NGO "Batgerelt-Ireedui" Disability Care Center

1) Facility Overview

① Establishment

The NGO began providing nursing care services for the elderly from 2009, and then expanded the target to people with disabilities. The center has provided services to a total of 100 people.

② Operating Entity

NGO "Batgerelt-Ireedui"

③ Target Residents

Residents are elderly people who do not have relatives to look after them, have difficulties in living their own, and always need medical and nursing care.

④ Mission

The goal of the project activity is "to provide a nursing care service with high satisfaction and improve quality of life by accepting elderly people and people with disabilities who have difficulties in living on their own, constantly need medical and nursing care in accordance with domestic legal system".

⑤ Number of Beds

31 beds.

⑥ Number of Staff

Staff placement - 10 people. Among them, 1 social worker. All staffs except social workers are family members and relatives of director of the center.

⑦ Number of Residents

Residents are 24 men and 7 women, aged 21 to 90, a total of 31 people. Some residents have mental illness, visual impairment, physical disability, cerebral palsy, etc.

- The center has signed contracts with nurses and doctors in other districts and are cooperating. Under the support of Enerel hospital, residents receive a regular medical examinations.
- The center aims to maintain and improve daily living behavior and promote participation in center work within the possibilities of residents.
- In order to improve and acquire vocational abilities, the center is promoting participation in study sessions such as handicrafts, cutting pictures, massages and cooking.

Cooperation with Overseas Institutions

Every year, director of the National Welfare Facilities of Switzerland visits the center and conducts specialized training as a support in addition to all staff training for 7 to 10 days.

3) Issues Facing the Facility

Issues on Human Resource Development

Every year, there is support from Switzerland as mentioned above, but it is not sufficient by itself. The lack of professional abilities of the staff are noticeable and training needs are high. In particular, it is necessary to learn about caring and responding to residents with unilateral paralysis, improving the abilities of social workers, etc.

Issues on Hardware Aspect

- There is a need for renovation of the building of the facility. A European company said that if the center owned the building, the company will support facilities and equipment aspect, unfortunately the building of center is rented. Currently the center pays a monthly rent of 1 million MNT.
- On the facility side, there are many run down items such as toilets, showers, beds, chairs, wheelchairs, etc. from the beginning of opening, and there is a need for updating.

2.4.4 Conclusion: Possibilities, Challenges and Support Needs of Nursing Care and Elderly People Field Development in Mongolia

(1) About Possibilities of Development of Nursing Care and Elderly Welfare Field in Mongolia

First of all, the possibilities for future development of nursing care and elderly welfare field in Mongolia is summarized as follows.

1) Improvement of Legal System Effectiveness

Through field surveys, there were many indications that although the legal system related to nursing care and elderly welfare exists but it is in a state of sleep without being utilized. Therefore, if the effectiveness of such legal system can be improved, environmental improvement can be expected.

2) Efforts of Private Facilities

In some private facilities, social workers were thoroughly managing personal records of elderly residents. In addition to individual record sheets which are in personal record center's proprietary format, social workers were also preparing personal files and focused on managing personal records that meet with Mongolian standards such as photocopy of identification documents, doctor's certificate, degree of disability / judgment of labor ability, agreement between the center and resident, etc. If this good practice can be disseminated to other facilities, it can be expected to improve the overall level.

3) The Presence of Human Resources that can become a Leader

There are persons with disabilities who have potential to become leaders among the participants of Duskin Leadership Training for Promising PWD youth, etc.

4) Cultural Background and Spirituality

In Mongolia, there is a culture that cherishes kinship connections. Respecting and caring for parents and grandparents is important. Children help with housework, and the custom of caring brothers, parents and grandparents is learned naturally. As the proper environment for nursing care is not in place, the service is now usually based on the staff's lifelong experiences enhanced with their creativity.

(2) Issues and Support Needs

1) Human Resources Aspect

First, the shortage of quality and quantity of nursing professionals is the most serious problem. It is cited as a common problem for each facility that conducted the field survey. Table 2-9 shows the number of professionals among all staff, and Table 2-10 summarizes the breakdown of professionals. Especially for private facilities, the number of professionals is largely short although the number of residents is small.

Table. 2-9 Number of Residents and Number of staff

No.	Facility name	Number of residents			Number of staff	
		male	female	Total	All staff	Professionals
1	National Elderly Care Development center	74	52	126	103	10
2	"Missionaries of Charity Mongolia" Bayankhoshuu center	25	0	25	15	2
3	"Missionaries of Charity Mongolia" Yaarmag center	0	25	25	11	1

4	NGO "Batgerelt-Ireedui" Disability care center	24	7	31	10	1

(Created by the survey team on the basis of the interview survey results)

Table. 2-10Breakdown of Professionals

No.	Facility name	Professionals							
		Total	Doctor (※1)	Nurse	Life counselor (※2)	Nursing staff (※3)	Functional training Instructor (※4)	Cooking staff (※5)	Others (※6)
1	National Elderly Care Development center	10	4	4	1	0	0	0	0
2	"Missionaries of Charity Mongolia" Bayankhoshuu center	2	0	1	1	0	0	0	4
3	"Missionaries of Charity Mongolia" Yaarmag center	1	0	0	1	0	0	0	4
4	NGO "Batgerelt-Ireedui" Disability care center	1	0	0	1	0	0	0	0

(Created by the survey team on the basis of the interview survey results)

(*1: Doctor / apprentice doctor, *2: Professionals equivalent to social worker, social welfare officer, mental health care worker, nursing care worker, etc. in Japan., *3: Nursing professional's equivalent to people who completed initial training, training for practitioners, care workers etc. in Japan., *4: Professional's equivalent to physiotherapist, occupational therapist, speech hearings, judo conservator, licensed masseur/masseuse etc. in Japan, *5: Professionals equivalent to administrative dietician, a dietician, a cook, etc. in Japan, *6: Sister etc.)

Regarding training needs, contents such as "How to communicate the elderly with intellectual impairment", "transferring", "position changing", "caring for unilateral paralysis residents", etc. were mentioned. But basically, it was said that there are general needs for training. Also regarding training methods, training in Mongolia for short term/medium term/long term, dispatch of experts from Japan, visits, training and practice in Japan were mentioned.

Therefore, as a direction for supporting Japanese-style care worker training program, the following steps are considered reasonable. Firstly, nursing staff initial training, then nursing staff practitioner training (former home helper level 1 and former nursing staff basic training), and in future, care workers training course is appropriate for introduction support. Moreover, targeting people who have qualification of nursing as candidates for human resources is also considered to have high relevance for better efficiency and effectiveness.

Furthermore, it is better to consider to institutionalize and implement human resource development equivalent to "nursing care assistant" in Mongolia, which is being undertaken as a model project in Mie prefecture, Japan.

Regarding the possibility of employment of nursing human resources in Japan due to the conclusion of the EPA, there were cited comments such as "Although it is expected that there are many applicants wanting to work in Japan because of its nice treatment and workplace environment, there will be required some qualifications, experiences, Japanese language ability". Although it is a problem that can not be solved easily, on the other hand,

with respect to national facilities, it is noteworthy that a major institution in Hokkaido have already started to teach Japanese language to four staff members in Mongolia, and planning to begin human resource development support which includes practical training and internship in Japan. If it is possible to work in Japan, it is thought that it will lead to improvement of the quality of future Mongolian nursing care industry.

2) Institutional Aspect

Necessity of Qualification System for Care Workers

Currently Mongolia does not have a specialized qualification system for care workers. In the interview from Social Welfare Service Department of Ulaanbaatar City, there was mentioned that "Currently, it is specified that to provide nursing care provision, it has to be specialized institution, but detailed of human resources requirement is not specified in the law" It seems that, workers who do not have the qualifications and expertise as mentioned above affects the current situation because they are the majority. Establishment of the qualification system and education system does not only improve the expertise and reputation of nursing care professionals and the quality of work, but also can ensure to recruit and retain quality staff by appropriate budgetary measures and improved attitude for the workers in nursing care industry.

Financial Issues

Compared to facilities supported by government and international organizations, the seriousness of the budget situation in the facilities managed by local NGOs in the private sector was revealed. They have serious financial problems because not only the original budget allocation is small, but also the determined fee which is charged from residents can not be collected due to some residents who don't have identification documents and some residents who have already borrowed their pension in advance. According to a private facility, "National facilities have support from government and overseas, and the annual budget is about 300 million MNT, but for center it is about 70 million MNT and it is insufficient for operating costs. Also, residents say that the facility is supposed to collect a part of the pension, but there are also many leaseholders of the pension and it is difficult to secure the funds."

Effectiveness of Legal System

On the necessity of improving the effectiveness of the related legal system, the group who run the organizations for of people with disabilities said "Mongolia has legal system services in place compared with other Southeast Asian countries, however the problem is that it is not in good working condition due to its low awareness and its poor management capability. In addition the present legal system does not support the participation of a group representing people with disabilities. As an example, the nursing care dispatch system is in place, but it is now not taking place for budget and issues related to finding personnel interested in working in this field, and however it is free for elderly people and people with disabilities to travel by public transport by law, since most of the buses are not wheel-chair friendly, many of the wheel chaired people cannot benefit this system. It is necessary to expand related budgets and improve infrastructure to boost the effectiveness of the legal system.

3) Facilities and Equipment Aspect

In terms of facilities and equipment aspect, all the places that we visited cited issues and support needs, but the support needs of the facilities and equipment of private facilities are overwhelming compared to the national facilities. In the national facilities, rehabilitation equipment and electric equipment were provided by overseas support, but private facilities did not receive much support of such hardware aspects, and many of the out of date items were being used from the establishment of the center.

Regarding national facilities, there is a need for training on proper equipment operation and equipment maintenance. Regarding private facilities as well, there is a high necessity of not only providing equipment but also training on maintenance in order to use the equipment continuously.

In order to solve the problem and deal with the support needs of the facilities and equipment as described above, engineers and technicians with practical ability to carry out technical work such as planning, designing, supervision, construction supervision, inspection, etc. which are related to construction, refurbishment and maintenance of buildings are required. Moreover, it is necessary to have personnel with the practical ability to operate and maintain of equipment, including electrical and electric equipment, and training such technical staff is also necessary.

(3) Finally: Towards Future Efforts

As mentioned above, the facilities have common requirements for the admission: accept residents who do not have relatives and need nursing care. But the study, it is seen that the elderly care facilities have become the place of contain elderly people in the area not the place of living accommodation.

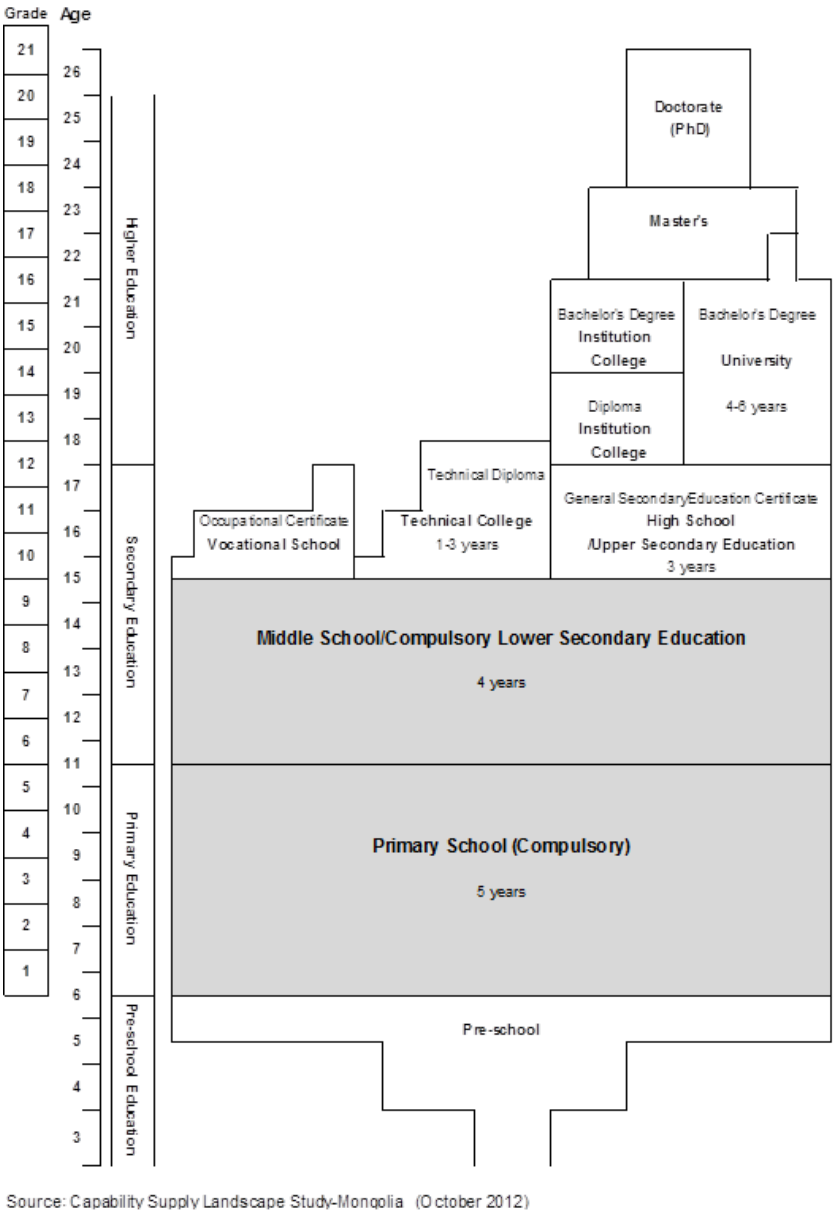
On the other hand, according to the interview survey, there are many cases where elderly people and persons with disabilities are left at home. Therefore, as a future medium long-term direction, it is necessary to establish a nursing care insurance system to stably provide high-quality service of health care and welfare so that elderly people will be able to live a dignified self-reliant life in their familiar area and residence, even if long-term care needs to be taken.

Lastly, low awareness of elderly care facilities among Ulaanbaatar citizens was also noticed at the time of the survey. Raising awareness among civil society, government and other parties about the actual condition in the elderly nursing care facilities is necessary for improving the nursing care and welfare environment.

Chapter 3. Outline of Higher Education in Mongolia and Industrial Human Development

3.1 Education System in Mongolia

The school education system in Mongolia is categorized into 4 types such as Preschool education, Primary education, Secondary education and Higher education (Fig3-1). In other words, Five years of elementary school (compulsory), four years of junior high school (compulsory), and three years of high school, a total of 12 years of basic education are necessary for students to go on to higher education.



Source: Capability Supply Landscape Study-Mongolia (October 2012)

Figure. 3-1 Mongolian School System Diagram[20]

[20]Fig3-1 dose not include Kosen education because academic degree is not settled by law and Kosen education introduced unified five-year education from 15 years old

① Preschool Education（5 years）

Preschool education includes nursery school and kindergarten from 3 years old to 7 years old.

② Primary Education（5 years）

Primary school for 5 years from 7 years old to 11 years old.

③ Secondary Education

Middle School / Compulsory Lower Secondary Education（4 years）

- ✓ Junior higher school (compulsory) for 4 years from 12 years old
- ✓ Upper secondary school is normally indicated as high school for 13 years from 16 years old. Also, Technical and vocational Education and Training (TVET) is categorized as the upper secondary school which delivers 2.5 years education from 16 years old student. TVET and other educational institutes are managed by MLSP excluded high school

④ Higher Education（Over 4 years）

Students have to finish compulsory education and high school to go on higher education. Higher education includes University, Institute, College, and Technical College.

3.2 Current Situation of Higher Education in Mongolia

Higher Education sector in Mongolia consists of University, Institute, College and Kosen Technical College. Kosen Technical College has been recognized as a part of higher education in April 2016 due to the amendment of Higher Education Law. Table 3-1 shows the current situation of higher education in the academic year 2015.

Table. 3-1 Current Statistics of Higher Education Institutes[21] in Mongolia (2015-2016)

Index	Types of HEIs				Total
	University	Institute	College	Branches of Foreign University	
Number of Higher Education Institutes (HEIs)	25	64	6	5	100
State HEIs	13	3	1	–	17
Private HEIs	12	61	5	–	78
Branches of Foreign Universities	–	–	–	5	5
Number of Students	122,870	38,869	570	317	162,626
Public HEIs	92,545	2,211	277	–	95,033
Private HEIs	30,325	36,658	293	–	67,276
Branches of Foreign Universities	–	–	–	317	317
Number of Students	5,393	1,596	106	26	7,121
Public HEIs	4,371	140	67	–	4,578
Private HEIs	1,022	1,456	39	–	2,517
Branches of Foreign Universities	–	–	–	26	26
Number of Students	9,782	2,978	169	128	13,057
Public HEIs	8,082	268	106	–	8,456
Private HEIs	1,700	2,710	63	–	4,473
Branches of Foreign Universities	–	–	–	128	128

Statistical Year Book Education and Science (2015-2016 Academic Year)

[21] Hereinafter, referred to as "HEI"

University offers Bachelor's, Master's and Doctoral programs, Institute offers Bachelor's and Master's programs, and College can offer only a bachelor's program. University develops students through their education program as well as offers the basic research and applied research. In addition, several universities offer the diploma program to deliver the various quality of education in Mongolia. Institute delivers the education as well as research through offering Diploma program, undergraduate program and graduate program (Master program only). College more focuses on education rather than research. Therefore, they offer the Diploma program and undergraduate program. Kosen Technical College was launched in April 2016 as a new higher education institute. The education system itself is very new. The government is preparing for the necessary legal environment now. The president of every institute of higher education is assigned by MECSS. Also, the quota of full-time bachelor's program in every university is also set up based on Human Development Plan developed by MECSS.

Table 3-2 shows the basic information regarding the higher education sector during the last decade, the current situation, and the distribution of higher education institutes, respectively. The number of students in HEIs is increased based on the needs of higher education since 2000. The number of students in the academic year 2015 increased by about 65% from the academic year 2002. The number of permanent staff members were increased about 25% in the academic year 2015 from the academic year 2002. However the growth rate of permanent staff members much lower than the growth rate of students due to the issue of financial resources in HEIs.

Table. 3-2 Main Indicators of Higher Education during the Last Decade

Indicators	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Higher Education Institutes (HEIs)	170	162	154	146	113	101	99	100	101	100
State HEIs	48	47	48	42	16	15	15	16	16	17
Private HEIs	116	109	101	99	92	81	79	79	80	78
Branches of foreign universities	6	6	5	5	5	5	5	5	5	5
Accredited HEIs	88	91	86	86	68	67	70	63	65	67
Total enrollment of HEIs	142,411	150,326	161,111	164,773	170,126	172,798	175,591	174,045	178,295	162,626
State HEIs	93,478	99,037	106,611	100,581	104,431	104,101	105,751	101,855	103,650	95,033
Private HEIs	48,552	50,878	54,114	63,835	65,306	68,302	69,353	71,689	74,233	67,276
Branches of foreign universities	381	411	386	357	389	395	487	531	412	317
Accredited HEIs	123,609	133,071	140,768	151,049	161,304	164,884	168,943	163,156	170,272	154,172
Total staffs employed by HEIs	12,175	12,492	12,555	12,849	12,824	13,021	13,175	13,212	13,360	13,057
Full-time faculty members	6,818	6,892	7,020	7,219	7,183	7,295	7,331	7,385	7,528	7,121

(Statistical Year book Education and Science (2015-2016 Academic Year))

On the other hand, the government integrated HEIs to assure the educational quality from 2007 to 2012 and some of the national colleges were categorized as Technical and Vocational Education and Training on middle education since 2007 to 2012. In addition, some of the private HEIs were closed due to the number of students decreasing. As a result, the number of HEIs decreased from 185 of FY 2003 to 100 institutes of FY 2016.
Table3-3 shows the percentage of students who entered university from full-time high school. The enrollment rate is continuously over 80% every year since 2010 and it shows a very high value compared to other countries.

Table. 3-3 Percentage of Education Continuance Rate (Full-time High School to University)

	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
Number of the graduate students (Full-time)	34,521	40,005	40,371	35,010	19,735	36,562	
Number of enrollment who enrolled university per full-time high school graduates	31,334	30,536	33,328	33,273	30,537	17,828	27,626
Number of enrollment (National University)	19,528	17,772	19,499	18,189	18,108	12,146	16,605
Number of enrollment (Private University)	11,806	12,764	13,829	15,084	12,429	5,682	11,021
Enrollment rate	83.0	88.5	83.3	82.4	87.2	90.3	75.6

(Statistical Year Book Education and Science (2015-2016 Academic Year))

Table 3-4 shows the distribution of higher education in Mongolia. 91% of HEIs is concentrating in Ulaanbaatar. Therefore, it could be a financial burden on students and family who live in rural areas in Mongolia.

Table. 3-4 Distribution of Higher Education in Mongolia（2015-2016）

	All HEIs	Branches in Rural Areas	All students	All staffs	All Full-time Faculties
Western Region	2	5	4,717	594	305
Bayan-Olgii	1	1	558	71	37
Govi-Altai	-	1	574	83	53
Zavkhan	-	2	486	199	72
Uvs	-	1	217	19	10
Khovd	1	-	2,882	222	133
Khangai Region	4	4	4,066	442	230
Arkhangai	1	1	1,207	114	67
Bayankhongor	1	-	225	21	9
Orkhon	1	2	2,261	264	130
Ovorkhangai	-	1	42	8	4
Khovsgol	1	-	331	35	20
Central Region	2	6	5,058	564	329
Darkhan-Uul	2	5	4,406	465	275
Dornogovi	-	1	652	99	54
Eastern Region	1	-	708	106	40
Dornod	1	-	708	106	40
The Capital					
Ulaanbaatar	91	-	148,077	11,351	6,217
Total	100	15	162,626	13,057	7,121

(Statistical Year Book Education and Science (2015-2016 Academic Year))

Revenue of HEIs is shown in Table 3-5. The main resources of HEIs are tuition fee from each student and it covers about 71% of total revenue in HEIs. Both of central and local governmental budget for HEIs are only 17.3% of total revenue in HEIs.

The number of the students has been increasing as well as revenues of tuition fee. As a result, the total revenue of HEIs was increased around 80% from AY 2012. However, rural governmental grant and subsidies from State Training Fund were decreasing.

Table. 3-5 Revenue of HEIs (2016)

Source of Revenue	Total	Undergraduate program	Graduate program (Master, Doctor)	Short Course
Central Budget	47,321,129.2	42,083,241.1	971,448.4	4,266,439.7
Local Budget	394,668.0	57,042.9	–	337,625.1
Income from core activities (Tuition payments)	237,889,795.8	213,732,585.6	21,294,324.2	2,862,886.0
Supported by the State Training Fund	14,142,157.3	13,761,673.7	380,483.6	–
Private payments	223,747,638.5	199,970,911.9	20,913,840.6	2,862,886.0
Income from subsidiary activities	20,744,229.0	18,711,562.6	1,579,113.5	453,552.9
Donations from organizations and indiciduals	5,173,692.5	4,982,219.2	185,587.9	5,885.4
Funding for programs and projects	4,612,953.5	3,141,102.2	642,606.8	829,244.5
Other	16,633,517.8	15,131,033.0	1,204,464.6	298,020.2
Grand Total	332,769,985.8	297,838,786.6	25,877,545.4	9,053,653.8

（Unit: 1,000MNT）

Number of graduates on engineering course and science course are much less than other courses (Table3-6).

Table. 3-6 Higher Education Graduates by Field of Study and Degree Earned (2014-2016)

Field of Study	Diploma	Bachelor's	Master's	Doctoral	Total
Education	2	4,983	1,070	11	6,066
Humanities and Arts	–	1,975	355	20	2,350
Social Sciences, Business and Law	8	10,874	2,698	25	13,605
Science	12	1,490	231	8	1,741
Life sciences (Biology)	5	157	58	3	223
Physics, Chemistry, Geology and Geography	3	529	122	3	657
Mathematics and Statistics	–	70	29	2	101
Computer Science	4	734	22	–	760
Engineering	71	4,842	369	7	5,289
Engineering	8	2,433	172	6	2,619
Manufacturing and Processing	40	1,439	130	1	1,610
Architecture and Civil Engineering	23	970	67	–	1,060
Agriculture	–	785	80	9	874
Health and Welfare	–	2,922	175	21	3,118
Services	–	1,824	275	5	2,104
Other	–	33	1	–	34
Total	93	29,728	5,254	106	35,181

(Source: Statistical Year Book Education and Science (2015-2016 Academic Year))

The National University of Mongolia, Mongolian University of Science and Technology, Mongolian State University of Agriculture, Transport Institute and German-Mongolian Institute for Resources and Technology as a national university and only a few universities such as Institute of Engineering and Technology, New Mongol Institute of Technology. However, there are not many HEIs have the faculty of science or faculty of engineering. The low rate of employment for the bachelor's program can be attributed to the fact that the number of graduates from the faculties of science and engineering is not many. Due to the abounding mineral resources, primary industries are a major industry in Mongolia. However, the Secondary industries such as manufacturing industry

which increases the value of natural resources are not developed. It means that there are not enough business opportunities for students who study engineering and science to work in that sectors. In addition, there is a mismatch between industrial sector and educational sector regarding the type of human resources. HEIs develop the students through their educational program, but the students are not well suitable for needs from industrial sectors. More practical engineers are looked for. Various factors shown above affected the fact that not many numbers of students want to study in science and industrial fields. As a result, out of the total number of students, only 5 % of the students graduated from science fields and 16.3% of the students graduated from engineering fields of total students. However for graduates of the master's program it is even lower, 4.4% in science and 7.0% in engineering respectively.

3.3 Current Situation of Kosen Education in Mongolia

3.3.1 Condition of Legislation

- Non-Governmental Organization Center for Kosen Education in Mongolia which was established in January 2014 (re-named as "National Kosen Association" in October 2016) accepted as the organization which undertakes introduction of Kosen education system in Mongolia with Minister's Law in Number 1A/4151 (Appendix 5) in 8th July 2014 by Ministry of Education and Science (Ministry of Education, Culture, Science and Sport in current name)
- In July 2014, Ministry of Education and Science researched education system in primary, secondary, higher education and university organization for revision of Education Law and Higher Education Law with working group on that. However, research on Kosen education system was not become a target of research. Therefore, Center for Kosen Education in Mongolia researched Japanese Education Law and standards for establishment of Kosen Technical Collage. And, they submitted translated that standards guide for establishment of Kosen Technical College in Mongolia.
- Center for Kosen Education was directed to testify Kosen education to be a higher educational institute by Ministry of Education and Science. Center for Kosen Education got understanding that Kosen Technical College is one of the higher educational institutes by indicating the abstract of Japanese Law on Education with advice from National Institute of Technology.
- The establishment of official working group for the draft law of Kosen education and draft standards for establishment of Kosen Technical College was decided in Ministry of Education and Science after top senior officials visited National Institute of Technology and Kosen Technical College in Japan. (Minister's Law in Number A/317 on 10th August 2015) (Appendix 6,7)

Working Group suggested adding following seven (7) items into Higher Education Law in terms of introduction of Kosen education in Mongolia.

1. Conferment of Associate Degree to Kosen Technical College graduates
2. Kosen Technical College will be added one of the HEIs
3. Five-year integrated education system delivered by Kosen Technical College shall accept secondary education graduates
4. One-hundred ten (110) credits will be required to acquire Associate Degree

5. Kosen Technical College can recruit teachers in Professional engineer
6. Associate degree will be added to degree hierarchy
7. Kosen Technical College graduates can be transferred to the third year of university

- I Items of "2. Kosen Technical College is added one of the HEIs" and "5. Kosen Technical College can recruit teachers in Professional engineer" are added to revise Higher Education Law in April 2016.

- Higher Education Law Number 1/4 4.5 required to set the standards of Kosen education. Working Group formulated common standards for Kosen education system in Mongolia with reference to some curriculum of Kosen Technical College in Japan (National Institute of Technology, Oita College, Tomakomai College, Sasebo College and Kumamoto College Yatsushiro Campus), curriculum of existing Kosen Technical Colleges in Mongolia, comprehensive high school and university's curriculum in Mongolia. These common standards were settled in Minister's Law Number A/177 on 4th May 2016 as follows.

✓ Objective of program
✓ Study plan
✓ Teaching plan (curriculum)
✓ Pedagogy
✓ Standards of educational environment
✓ Requirement for new students
✓ Requirement for teachers
✓ Prospective skills and technics of graduates
✓ Students grades and valuation
✓ Quality confirmation of program
✓ Information system of organization of management
✓ Cooperation and affiliation with external organization

- Except for Kosen Technical College curriculum, Kosen education system is followed to common items of categorization rules of HEIs (Minister's Law Number 26 on 21st January 2010) since Kosen Technical College was one of the HEIs (Appendix 9).

According to the background above, legislation for Kosen education system in Mongolia is not perfect enough with regard to the current situation in existing Kosen Technical Colleges in Mongolia which already accept students, conferment of degree in graduating Kosen Technical College and legal environment regarding to transfer from Kosen Technical College graduates to the third year of university should be settled immediately.

3.3.2 Related Organizations of Kosen Education

Figure 3-2 shows related organizations of Kosen education system in Mongolia.

Kosen education system and Kosen Technical College itself are managed by MECSS in accordance to the position of Kosen education system which is one of the Higher Educational Institutes. And, National Kosen

Association (Center for Kosen Education in Mongolia in former name) is settled to support policies on Kosen education system and to manage counter service for Kosen education system related organizations in Japan. Additionally, Society for Establishment of Mongolia Kosen is newly founded to support business-academia collaboration such as internship and collaborative researches by Kosen. These supporting organizations and existing three Kosen in Mongolia are to promote Kosen education.

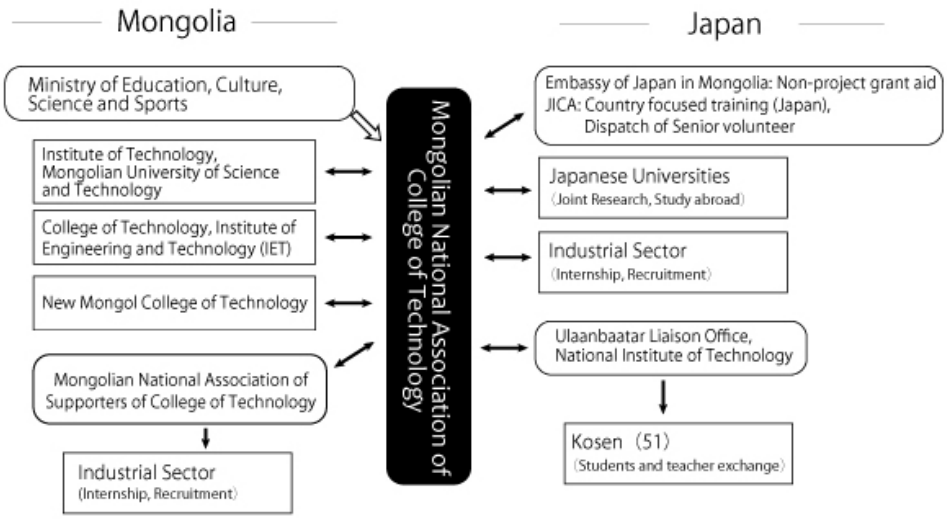


Figure. 3-2 Kosen Education and Related Institutions

- Ministry of Education, Culture, Science and Sports (MECSS)

MECSS is mainly managing Kosen education system in Mongolia. Division of Higher Education is the main body of legislation of Kosen education system in Mongolia. Figure 3-1 shows an outline of Ministry.

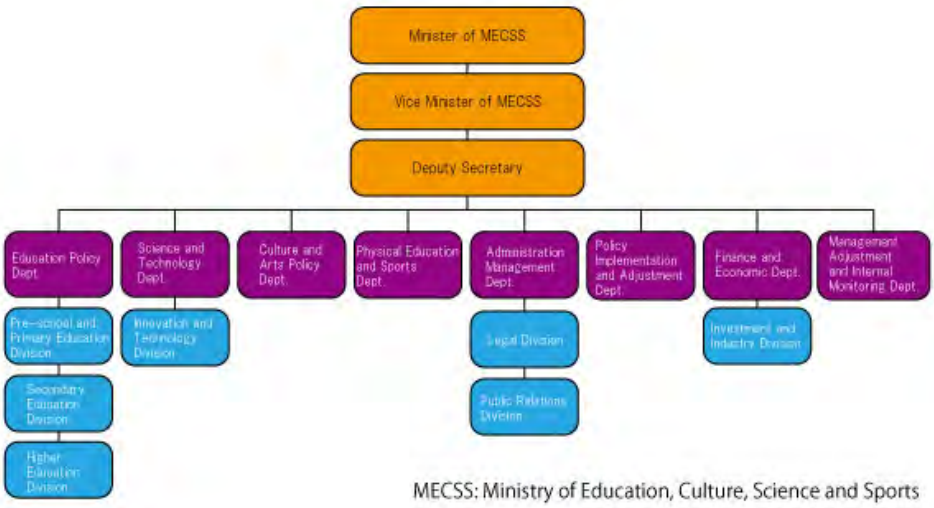


Figure. 3-3 Organization of MECSS

Ministry is composed from eight departments which are; Education Policy, Science and Technology Policy, Culture and Arts Policy, Physical education and Sports, Administration Management, Policy Implementation

and Adjustment, Finance and Economic, and Management adjustment, internal monitoring, under Minister, Vice-Minister and deputy secretary. Education policy in Mongolia is mainly settled by the division of education policy, and higher education policy is managed by the division of higher education.

The outline of departments and divisions which are related to higher education policy are as follows.

(a) Division of Education Policy

To develop laws and acts related to education sector in general, and to settle short, middle and long-term plan and strategy of education promotion policy and draft master plan in Mongolia.

(b) Division of Science and Technology Policy

To develop concepts of laws and acts related to science technology promotion and produce programs. To research regarding to policy management and science technology.

(c) Policy Implementation and Adjustment

To coordinate the counterparts, related division and implementing institute for implementing the project and program in accordance with the policies.

To develop the plan of fund-raise as well as to arrange the organization structure for implementing the project/program smoothly.

- Mongolian National Association of College of Technology

  Mongolian National Association of College of Technology is a Non-Profit Organization to support for Kosen education Policy by MECSS. This organization becomes a counterpart in Mongolia to collaborate among existing Kosen Technical Colleges, universities and industry in Mongolia. The Association is managed by Chairman (Director of Institute of Technology, Mongolian University of Science and Technology), Secretariat general (one of directors of current Kosen of Mongolia roundly in a year), two teachers in Mongolian national universities, and three former Japanese teachers of Kosen.

- Mongolia Kosen Cooperation Forum

  Mongolia Kosen Cooperation Forum is supporting collaboration among existing Kosen Technical Colleges in Mongolia and Mongolian industries. Especially, it has the role of industry-academia collaboration which is the characteristic of Kosen education system (such as internship program and collaboration researches) and employment support after graduation. This cooperation is composed by board members such as Director of Institute of Technology, Mongolian University of Science and Technology, Vice-Dean of MUST, Department chief of Industry-Academia Collaboration in National University of Mongolia whose are alumni of studying in Japan. Currently, Mongolian Construction Association is a member, too.

In addition to these bodies, there are Japanese organizations in Mongolia.

- Ulaanbaatar Liaison Office of National Institute of Technology

  National Institute of Technology established Liaison Office in Mongolia in November, 2016. This Liaison office is the first international branch and one of three offices overseas of National Institute of Technology. The main roles of Liaison office are to promote Kosen education system expansion and researches. A Japanese officer will be allocated as the Chief of Liaison Office in Mongolia from April 2017. Currently, the local chief and two staff members are working on it.

3.4 Current Situation of HEIs in Mongolia

3.4.1 Mongolia University of Science and Technology (MUST)

MUST is one of the prestigious HEIs in Mongolia and the nation's only university dedicated to science and engineering, and the only higher education institution specializing in scientific, technological and engineering fields. MUST is composed of 18 schools until 2013. However, the schools have been integrated into 8 schools in 2015. TVET and the Kosen are also managed by MUST as affiliated schools. Diploma program, bachelor degree course and postgraduate courses (Master's and Doctoral degrees) are provided by MUST.

Table 3-7 shows a statistics of MUST. The number of staff is over 1,000 including 723 lecturers in January 2017. There are around 21,000 students are studying in 8 schools. In fact, there is no adequate number of faculties to cope with the large amount of students. Same problem has been informed through "JICA Data Collection Survey on Higher Education of Engineering in Mongolia (2012)"

In order to compare Kosen education system, this section evaluates the current status of undergraduate program in MUST.

Table. 3-7 Number of Students and Faculty in each Department

Department (Undergraduate)	# of Educational Program	# of Students	# of faculties
Civil Engineering and Architecture	7	3,200	104
Business Administration and Humanities	12	2,300	117
Industrial Technology	15	2,900	88
Geology and Mining Engineering	12	3,500	111
Information and Telecommunication Technology	9	2,700	100
Power Engineering	7	2,800	74
Mechanical Engineering and Transportation	10	2,300	19
Applied Sciences	10	1,300	110
Total	82	21,000	723

3.4.2 Education System

A lesson delivered in MUST is composed of lecture (60%), exercise (20%) and laboratory (20%). The ratio of the laboratory is not high especially for the undergraduate program. Then it shows that theory oriented lectures are provided in class. The university tends to develop the skilled engineer or researcher through the program including Master's course and Doctor's program in not only the Mongolia but also the other countries. So university more focuses theory oriented lectures rather than more practical lessons.

3.4.3 Issues on Education Program in MUST

The theory oriented lectures are mainly provided on undergraduate program in MUST. There is concern about students that they could not obtain the particular ability such as practical intelligence and problem-solving skills due to lack of exercise end laboratory work and lack of necessary educational and research equipment. Furthermore, most of the equipment installed on MUST are very old.

18 schools were integrated into 8. However, integrated schools are not fully utilized until now. MUST still delivers the lesson based on subdivided engineering education. It brings a gap between the ability of MUST graduates and engineering human resource with the high versatility needed by industries.

In this condition, MUST is implementing the projects to improve the quality of education.

- Higher Engineering Education Development Project (M-JEED)
  - ✓ Curriculum development through Twinning program (Mechanical Engineering, Architecture and Civil Engineering)
  - ✓ Capacity building of lecturers and researchers through Joint Research Program
- Introduction of CDIO framework
  - ✓ Improvement of curriculum of bachelor by CDIO framework

3.4.4 Students' Employment Rate

Table 3-8 shows the employment rate of graduates by schools[22]. In 2013, about 100% of students could obtain the job. The employment rate was getting decreased in 2016.

Table. 3-8 Employment Rate in Schools, MUST (%)

School	Employment Rate
Civil Engineering and Architecture	44
Business Administration and Humanities	37
Industrial Technology	53
Geology and Mining Engineering	39
Information and Telecommunication Technology	32
Power Engineering	72
Mechanical Engineering and Transportation	56
Applied Sciences	47

（Source: Employment Survey－MUST）

The low employment rate was affected by the economic situation of recent days. At this moment, the employment rate in school which is related to energy, mechanical engineering, and industrial technology is relatively higher than other schools. However, the low employment rate in civil and architecture engineering, geology and mining engineering prove the worsening of economic conditions in Mongolia.

[22] Employment Survey- MUST (July, 2017)

3.4.5 German-Mongolian Institute for Resources and Technology（GMIT）

German-Mongolian Institute for Resources and Technology (hereinafter referred to as GMIT) has been established to improve the quality of HEIs and conduct research for leading the edge of technology in 2013 based on the mutual efforts between Ms. Angela Dorothea Merkel, a prime minister of German and Mr. Tsakhia Elbegdorj, the president of Mongolia. GMIT offers the undergraduate program and graduate program (Master's course) in the Nalaikha. German Agency for International Cooperation (GIZ) has implemented a project for capacity building to make GMIT management more stable.

The quota of students is 500. Currently, 100 students are studying in GMIT and its number will be increased year by year. GMIT provides the small-class education for giving effective lessons to students. Along with that, students and lectures are living in the same dormitory like Kosen Technical Colleges in Japan.

There are various lecturers from Germany and America as well as Mongolia and in total 65 experts working in GMIT. Even Mongolian lecturers have the experience to conduct research in Germany and America. 60% of the lecturers obtained Doctor degree. The GMIT is offering the high-quality education through utilizing the talented lectures. One of the fundamental factors for guaranteeing the quality of an education service in GMIT is a human resource from Germany. The International lecturers have been introduced by Deutsche Akademische Austauschdiens (German Academic Exchange Service, hereinafter referred as DAAD) and necessary cost to work in Mongolia is fully covered by DAAD. At the same time, some of management staff members are sent to DAAD.

There are 4 programs (Raw materials / Process engineering, Mechanical engineering, and Environmental engineering) to offer students. Once students finish their 4-year study, they can obtain the Bachelor of Science as a degree. Basically, GMIT optimizes the curriculum developed in German. However, they conduct the survey through the questionnaire to evaluate the need and demand in the industrial sector in Mongolia and reflect the feedback to their educational contents. As a result, 80 companies answered. The lectures are delivered with experiment and laboratory work using the high-quality equipment settled by German at no charge.

The lectures are taught in English. If the students need a supplemental study before entering the GMIT, GMIT offers preparatory education course for 1 year to the student. Then students could attend lectures such as English, Math, Physics, Chemistry and so on. GMIT gives the opportunity for to experience in society by internship program. Through making good relationship with industrial sectors, GMIT thought they could secure the place of employment for students. The first batch will graduate in 2018.

3.5 Overview of Technical Vocational Education and Training (TVET)

3.5.1 Outline of Technical Vocational Education and Training (TVET)

Technical Vocational Education and Training (TVET) is not a higher education institute such as university or Kosen Technical College but one of vocational institutes which has been relegated from Ministry of Education and Science (current MECSS) to Ministry of Labor (current Ministry of Labor and Social Welfare) by the government in June 2012. TVET mainly targets to cultivate workers.

Table 3-9 shows the basic data of TVET. Currently, there are 80 TVET and a half of them are established in countryside. There are around 20,000 newly enrollees. And, there are around 10,000 enrollments who graduated from lower secondary school entered vocational school in 2.5 years education (after 2012-2013).

Table. 3-9 Basic Data of TVET

	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Total Number of TVET	63	71	78	79	76	80
National TVET	44	49	50	53	52	49
Private TVET	19	22	28	26	24	32
TVET in Ulaanbaatar	26	28	34	34	32	38
TVET at Countryside	37	43	44	45	44	42
Number of students	46,071	48,134	45,225	42,798	42,797	42,675
Number of newly enrolls	19,358	19,417	19,607	20,921	20,804	20,961
Number of Lower Secondary School Graduates among enrolls	13,186	11,116	10,741	9,944	10,928	10,388
Number of Upper Secondary school Graduates among enrolls	2,865	4,094	4,123	5,738	5,130	3,195
Number of graduates	18,705	23,120	23,393	18,358	18,978	
Number of being employed （employment rate）	10,148/54.2%	128,55/55.6%	13,334/57%	115,08/62.7%	10,759/56.7%	

TVET is composed by formal type and non-formal type. Main institutes of each type are following.

- Formal type:
  Vocational Training & Production Center （VTPC），（Poly-technic）College
- Non-formal type:
  Non-Profit Organization to provide around three-month vocational technical training

Formal type program provides Vocational Education and Technical Education, and target of each education is junior high school graduates and senior high school graduates. Graduates from Vocational Education receive Certificate of Graduation from Senior High school, and graduates from Technical Education receive diploma. Non-formal type program targets the age over 18 years old. Training Certificate is issued for those who complete that program.

Chart 3-10 shows the main educational programs provided by TVET.

Table. 3-10Educational Programs Provided by TVET

	Age of Enrollment	Duration of Education	Qualification/Certificate
Vocational Education	15 years old	2.5 years	Secondary Education Certification

Technical Education	Over 18 years old (those who completed vocational education and senior high school)	1.5-3 years	Diploma in Technical Education
Vocational Training	Over 18 years old (adult)	1-2 months	Training Certificate

(Source: Extracted from Statistics of Ministry of Labor and Social Welfare)

3.5.2 Characteristics and Issues of Curriculum of TVET

The main curriculum of TVET is practical training which is different from comprehensive education. The characteristics of TVET is to acquire technical skills besides theoretical parts by classroom lectures. Therefore 70% of educational curriculum at TVET is practice, training and internship which tries to gaining skills by practice, while 30% of curriculum are classroom lectures. On the other hand, the problem of lower level of theoretical part and specialized knowledge is indicated by industrial field. This issue might be effected by less-hours of lectures as well as contents of lectures. And, TVET students seem to have less skills of team working and communications since the education specifies technical skills acquirement.

Table 3-11 shows study majors which are provide in TVET. There are various majors to correspond different needs from industries.

Table. 3-11Various Majors in TVET

Sewing and Tailor	Mechanical repair and Driving	Carpenter	Electric engineer
Plumber	Heavy machine repair	Welder	Cook
Tray service, bakery	Construction	Barber	Mining machine repair
Plasterer	Farm animal production	Brick craftsman	

3.6 Comparison Among Kosen Education and Other Education in Mongolia

3.6.1 Differences between Other Education Institute in Mongolia

This chapter evaluated the position of the Kosen education in among education institute in Mongolia through comparison. Table 3-14 and Figure. 3-4 shows the characteristics of HEIs.

First of all, one of the big differences is the age of graduation. University (undergraduate) students will graduate at 22 year old, Kosen Technical College students will graduate at 20 years old and TVET students will graduate at 18 years old. The meaning of this is industry sector could acquire the young people who has a practical knowledge and skills which is equivalent.

In this section, the position of Kosen education system in Mongolia at education sector is examined by comparison among Kosen education system and other education.

Table3-12 and Figure. 3-4 show the comparison in characteristics in each educational institution. The significant difference between university and Kosen Technical College is enrollment age. Kosen Technical College accepts lower secondary high school graduates, while university accepts general upper secondary high school graduates. TVET accepts lower secondary high school graduates as well as Kosen Technical College. In terms of educational duration and graduation age, university (undergraduate) is 4 years and 22 years old, Kosen Technical College is 5 years and 20 years old, and TVET is 2.5 years and 18 years old. This difference is essential

since there is the education institute which cultivates people with knowledge and skills in university level earlier than university. The advantage of this institute is unmeasurable.

Kosen education system is a higher educational institute, while TVET is a secondary educational institute. Characteristics of university and Kosen education are somehow similar, although, characteristics of TVET is different. In terms of human resource development in industry, university and Kosen education system tries to cultivate specialized engineers, while TVET tries to cultivate technicians. With all things considered, Kosen education and TVET will not be colliding with each other[23].

Table. 3-12 Difference among Kosen Technical Colleges and Other Education Institutes in Mongolia

	University (undergraduate)	Kosen Technical College	TVET
Enrollment age	18years old	15years old	15,18years old
Study duration	4years	5years	2.5,1.5years
Graduation age	22years old	20years old	18or 20 years old
Degree	Bachelor(Bachelor of Engineering)[24]	Diploma (Engineering)[25]	Certificate of high school graduation, Diploma (vocational training)
Characteristics of education	- Emphasis on theory - Proper balance of general subject and specialize subject - Acquire scientific perception-Graduation research	- Engineering human resource development through 5 years consistent education - Proper balance of specialized subjects similar to university and subject of practice and experiment - Acquire of perception in engineering	- Education of technics through practice and internship
Human resource development in industry	Engineer	Engineer	Technician

Figure 3-4 compares education curriculum of university and Kosen education system. The main curriculum in university are lectures of theory to acquire knowledge. On the other hand, curriculum of Kosen education system is called Spiral-up curriculum which balances with practices, experiments and lectures properly to emphasize application of knowledge into real engineering. Experiments are settled into both curricula to deepen understanding of theory and specialized knowledge. While, Kosen education system spends longer time for

[23]Technician: People with skills of production, manufacture, processing. Engineer: People with specialized knowledge and methodology, and have ability of comprehensive designing and planning.
[24]Academic Title which is conferred for those who complete certain curriculum at higher educational institutes or those who acquire the same competency
[25]Graduation certificate or achievement certificate issued by higher educational institute

experiments compared to university since Kosen education curriculum puts experiments subject from the first year.

Another characteristics of Kosen education is training activities. Kosen education gives the practical assignment through practice/training and internship to gain practical skill, application skill and problem solving skill efficiently. University also requires students to experience of internship, although, it is considered to be a part of recruitment activity as well as getting experience at company.

The objective of both Kosen education system and university is human resource development of specialized engineers. University aims to cultivate professional engineers who have specialized knowledge and scientific perspective. On the other hand, Kosen education aims to cultivate practical engineers who have practical ability and creativity upon lectures, experiments, practice and training. Human resources developed by Kosen Technical College (regular course) and university (undergraduate) are expected to work at engineering fields with their versatile knowledge. Kosen Technical College graduates play an important role in quality/process management, sanitary/safety management with practical skills such as application or problem solving. And, a few Kosen Technical College graduates work as specialized engineers in various fields like Research and Development. In comparison, University graduates become engaged to various engineers or Research and Development with professional knowledge and theories.

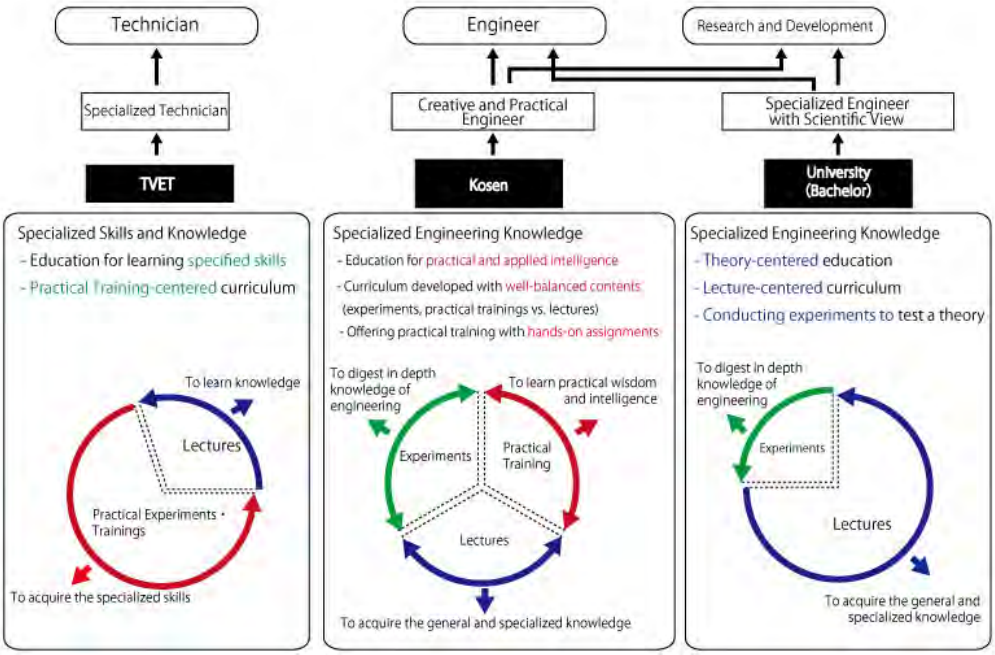


Figure. 3-4 Difference among Each Educational Institutes

3.6.2 Overview of Engineering Education in HEIs in Each Country

This section discusses that engineering education in each country through the comparison. Table 3-13 and 3-14 explain that education system and characteristics of education institutions in America, England, German

and Korea. Current engineering education shows a tendency toward diversity. Some of the countries deliver the engineering education in the secondary education. We evaluated the engineering education in each country based on International Standard Classification of Education (hereafter referred to as ISCED) developed by UNESCO (1997) as well as European Qualification framework.

Table. 3-13Practical Engineering Education among Country (Part 1)

Country	USA		England	Germany	
Institution	Two-years university (ISCED 5A／5B)	Four-years university (ISCED 5A)	University (Basically, ISCED 5A, EQF6)	Fachhochschule (Specialized university) (ISCED 5A, EQF6)	Universität (University) (ISCED 5A, EQF6)
Overview	・Community College mainly managed by states and local government ・Various program are provided based on needs by participants from community. ・Commercial based two-years university has been increased to follow the demand for labor in recent days.	・Categorized into for types of institutes such as University, Liberal arts college, Specialized college ・Providing Education and research function on a regional scale	・After the integration of higher education institutions in 1992, university's function has been become more diverse ・Categorized into two types such as old model university and new model university ・Old model university: Tend to focus on academic. It has been existing since 1992. In 1992, Polytechnic was recognized as university. ・New model university: Tend to focus on practical training, learning and knowledge.	・Former Engineer's school. It has been recognized as higher education institution since 1968. ・Former Engineer's school was categorized as vocational school under higher-middle education ・Aiming to develop engineers with practical skills and knowledge	・Traditional university ・Academic oriented (Tend to develop researchers)
Function	・Community College: Aiming to proceed to the university. Providing vocational education and other education such as adults' course and immigrant's course. Degree and certificate are provided. ・Commercial based two-years university: Providing vocational education program based on demand on social needs. Degree and certificate are provided.	・University: University consists of liberal arts school and graduate school. It focuses on education provided in graduate school and research activities. ・Liberal arts college: Providing bachelor's degree ・Specialized university: It includes various schools such as law school and medical school. Providing specialized education targeted specific areas. Providing graduate education as well	・Providing degrees	・Providing practical research (in particular, technology, economics, social science, public welfare and agriculture ・Providing degrees	・Research activities ・Providing (especially, Doctoral degree) ・Providing the license to give lecture in university
Required years of education to be enrolled	12 years	12 years	13 years	12 years	12 years or 13 years
Requirements	Graduated from high school (in case of community college, all of the the people who wish to study at there can enter the school)	Graduated from high school Obtained any requirements by university (ex. number of credit and academic records in high school, certificate of SAT or ACT)	GCE・A Certificate of latter middle-education	Qualification to be enrolled specialized university (Specialized university Abitur) Qualification to be enrolled university (Abitur)	Qualification to be enrolled university (Abitur)
Degree	Course to aim to transfer the university (ISCED 5A) ・Associate (degree) Vocational Education Course (ISCED 5B) ・Certificate(Non-degree)	・Bachelor degree (ISCED 5A) ・Master degree (ISCED 5A) ・Doctor degree (ISCED 6)	・Foundation degree(ISCED 5B, EQF5): ・First degree/Bachelor(ISCED 5A, EQF 6) ・Master degree (ISCED 5A, EQF 7) ・Doctor degree (ISCED 6, EQF 8)	・Diplom (ISCED 5A, EQF 6) ・Bachelor degree (ISCED 5A, EQF 6) ・Master (ISCED 5A, EQF 7)	・Diplom (ISCED 5A, EQF 7) ・Magister (ISCED 5A, EQF 7) ・Bachelor (ISCED 5A, EQF 6) ・Master (ISCED 5A, EQF 7) ・Doktor (ISCED 5A, EQF 8)
Schooling Period	・Associate degree: 2 years ・Certificate: Less than 2 years	・Bachelor:4 years ・Master:1～2 years ・Specialized degree:1～4 years ・Doctor: More than 3 years	・Foundation degree:2 years ・First degree/Bachelor:3 years ・Master:More than 1 year ・Doctor:3 years	・Diplom: With in 4 years ・Bachelor: 3～3.5 years ・Master :1～2 years	・Diplom, Magister :4.5 years ・Bachelor: 3～3.5years ・Master:1～2years
Cultural Subjects	Yes	Yes	No	No	No

(Source: Based on 6th meeting, Working Group of new practical vocational education. Ministry of Education, Culture, Sports, Science and Technology Japan)

Table. 3-14Practical Engineering Education among Country (Part 2)

Country	Korea		Malaysia		Japan
Institution	Specialized University (ISCED 5B)	Four-years university (ISCED 5A)	Polytechnic ／College (ISCED5B)	University	Kosen (Regular course) /(1st grade ～ 3rd grade: ISCED3B/4th grade ～ 5th grade: ISCED5B)
Overview	・Providing vocational education as short term higher education institute ・"The school providing the specialized knowledge, theory as well as conducting the research to train students intellect to be professionals/experts for the society" (Article 47th, Higher Education Law)	・Traditional University delivering academic theory and research activities ・"The school aims to cultivate the students' persona and deliver the necessary wisdom applied knowledge and research activities to educate them for future development for our country and human society" (Article 28th, Higher Education Law)	・Delivering the education for students who graduated from middle school. ・Provide Vocational education for 3 years from 18years old to 20 years old. ・A few college offers twining program with universities in other countries. The student studying in twining program could obtain the degree in foreign university.	・After implementing Private Higher Education Institutions Act 1996, the private institutes could offer the bachelor degree. Before the act, private institutes only provide the diploma. ・There are 20 national universities, over 60 private universities include international branch schools	・Educate the students to be engineer who have creative mind, practical knowledge and skills
Function	・Providing specialized bachelor degree (If the school has bachelor course, they could provide bachelor degree as well)	・Providing degree	・Providing diploma or advanced Diploma	・Providing degree which is higher than bachelor degree	・Providing associate degree
Required years of education to be enrolled	12 years	12 years	11 years	12 years or 13 years	9 years
Requirements	Graduate from high school Or students who are considered that they have academic ability which is same as/higher than high school graduates by law	Graduate from high school Or students who are recognized that they have academic ability which is same as/higher than high school graduates by law	1. Graduate from middle education 2. Obtain required achievement on SPM	Students who studied at pre-education course for 1 to 2 years to enter university	Graduated from early middle education Students who achieved the required result at entrance examination
Degree	・Specialized degree (Associate degree) (ISCED 5B)	・Bachelor degree (ISCED 5A) ・Master degree (ISCED 5A) ・Doctor degree (ISCED 6)	・Diploma (ISCED 5B) ・Advanced Diploma (ISCED 5B)	・Bachelor degree (ISCED 5A) ・Master degree (ISCED 5A) ・Doctor degree (ISCED 6)	・Associate degree (ISCED 5B)
Schooling Period	2～3 years	4 years	3 years	3 years(Law, Literary study, Economics, Science, Engineering) 4 years(Medical science・Dental science)	5 years
Cultural Subjects	Yes	Yes	Yes	Yes	Yes

(Source: Based on 6th meeting, Working Group of new practical vocational education. Ministry of Education, Culture, Sports, Science and Technology Japan)

Referring the Table 3-15, the major HEIs in each country are categorized as university and vocational school. INCED graded university and vocational school “5A” and “5B”. University in any countries are targeting to be research-oriented university and they tend to offer the undergraduate program for the student to encourage them to continue to graduate program. On the other hand, the programs provide lectures with necessary theory and technique for developing the practical engineers.

Table. 3-15INCED 1997- Category and Program

Level5A Higher education (University Type)	Theory-oriented, the preparation program for advanced research activities. This curriculum aims to cultivate the students to have enough skill and knowledge for conducting research activities in science related schools such as medical, dentistry, architecture and engineering. This program requires the minimum 3 years of full-time education. In fact, most of the program need over 4 years to achieve the required level of education.
Level5B Higher education (Non-University Type)	In general, this program focuses on practical and technical learning contents and vocational skills which is linked with employment in short school years. Basically, it is required more than 2 years of full-time study.

A higher educational institute above requires students should study for 12 years (or 13 years) in primary and secondary education. Students could earn the degree in Bachelor, Master, and Doctor. A specialized university offers the degree corresponding to the educational program they provided, basically it awards the equivalent of the ISCED educational level. Otherwise, a specialized university may issue the certificate. In the case of America as well as Korea, students who belong to the program categorized as the ISCED-5B could obtain the associate degree and in the case of England, students could obtain the foundation degree which focus on practical lessons and excise. On the other hand, a specialized university in Germany tries to develop the practical-oriented engineers through the lectures at the same level as the university. Then that university offers the Bachelor degree, Master degree, and Diploma.

The factors above showed that Kosen education system has unique characteristics among other higher educational institute in the other countries. Kosen education system starts to give unified five-year education from 15 years old and no any other higher educational institutes have same systems of education to grow the practice engineers.

3.7 Position of the Kosen Education among Other HEIs in Mongolia

Analysis above clarified that targeted type of human resource of Kosen education and other HEIs are clearly different. The universities want to develop the professional engineers who have the both theory and specialized knowledge with the scientific viewpoint. At the same time, the universities also want to educate students in the graduate schools to become advanced engineers and professional researcher. Therefore, university more focus on theory-centered learning in the classroom.

Kosen education system provides similar level of universities education such as experiments, laboratory and training in proper balance. Then this institute aims to cultivate practical engineers with creative mind.

In addition, not only the knowledge but also the practical intelligence, problem solving skills and competency are developed through experiments and laboratory work. It is an advantage of Kosen education system among other HEIs in Mongolia. As a result, it is possible to accept various need of human resource by industrial sectors.

Establishment of Kosen education system in Mongolia has enormous significance in the current situation of human development needs in Mongolian industry and human resource development in university. Previously mentioned, Kosen education system aims to cultivate practical engineers with skills, creativity and knowledge at university level through consistent 5 years education program from 15 years old to 20 years old, 2 years earlier than university graduation. This aim of Kosen education system may solve the problems of occupational ability in Mongolian industry mentioned in Chapter 2, and may cultivate mid-level engineers position such as planning and development, quality and process management, and sanitary and safety management which have great needs from industry much earlier. And, it is expected to develop human resource who contribute to industrial development and diversification in Mongolia based on this Kosen education system cultivates people with comprehensive engineering knowledge, application skills and problem solving.

From these points of view, what are the essential matters for Kosen education system in Mongolia are to confirm the position of HEIs institute which produce mid-level engineers or professional engineers at an early age, and to acknowledge Mongolian society as well as Mongolian industry which has strong needs of those engineers.

Chapter 4. Current Situation of Existing Kosen Technical Colleges in Mongolia and their Problems

Chapter 4 outlines current situation of existing Kosen Technical Colleges that have already been established in Mongolia and discuss their problems. First, in 4.1, we recollect how Kosen Technical Colleges had been brought in Japanese educational system, what they have been contributing to Japanese industries and then we intend to pick up National Institute of Technology, Sasebo College as an example of Kosen Technical Colleges in Japan, which shows a standard of Kosen education system: the readers can grasp difficult situations of existing Kosen Technical Colleges recently established in Mongolia; the number of departments of Sasebo College is four, which is near to the numbers of those of each Kosen Technical College in Mongolia. In 4.2, we describe how Kosen education system has been introduced to Mongolia noting that in Mongolia Kosen education system was set up by people of strong willpower and action who had studied in Japan, whereas in Japan the system was initiated through demand from the industrial area. In 4.3, we report current conditions of the existing Kosen Technical Colleges and in 4.4 analysis their problems.

4.1 History of Kosen Education in Japan, their roles and an example of Japanese Kosens

4.1.1 How Kosen Technical Colleges had been brought in Japanese Educational System and their Roles

- Establishment of Kosen Technical Colleges in Japan and their roles

In late of the 1950s – just before Japan entered economic boom in the 1950s – the then Japanese industrial circles demanded establishment of new educational institutes which would train mid-level engineers to the Japanese Government in perspective of upcoming shortage of labor supply and engineers. The industrial circles aimed to restore an effective system of higher Technical Colleges in pre-World War II period.

In 1961, meeting the demand, the Japanese Diet legislated Kosen Technical College as a higher educational system of five year course which admits graduates of junior high schools. In 1962, first Kosen Technical Colleges – 12 national colleges – were established. As of 2016, Japan has 51 national colleges, three public colleges and three private colleges as Kosen Technical College.

Kosen Technical Colleges, which can be regarded as only one sideline educational system in Japan differing from senior high schools or universities as to curriculum, enroll 15-year old students who have just finished junior high schools to bring up engineers with hands-on skills, mid-level engineers and engineers with knowledges tantamount to university graduates. Kosen Technical Colleges admit and train teenagers with ambition to be engineers. They have been fulfilling their roles as elite educational institutes taking on the responsibility to equip the young students with high ability of practical and professional skills and special knowledge equivalent to bachelors and send them to industrial area.

The feature of Kosen Technical Colleges is to instill technical expertise as well as basic theoretical knowledge in students, to rear engineers with craftsmanship through their technical education in view of practical manufacturing and to build up character through life in a school dormitory and extracurricular activities.

Kosen Technical Colleges' curriculum has a characteristic such that general education subjects and major engineering subjects are arranged in 'wedge-shaped' (major engineer subjects start in year one and gradually increase until year five) to maximize effectiveness of the five-year education. They carry out small-class education – 40 students in one class.

Besides general education and major engineering education, Kosen Technical College has special educational approach such as school dormitory life from 15-year old, club activities and robot contest, which cannot be found in universities. Since highly qualified teaching staff who have also an insight of a researcher dedicates themselves to guide highly motivated students via considerately and conscientiously throughout the five-year educational period, Kosen Technical Colleges in Japan have graduated a plenty of students with high level of specialties, techniques and communication skills so far. In fact, ratio of job offers to Kosen Technical Colleges graduates have been greater than 20, which shows that industrial circles appreciate Kosen education very highly.

From 1990s, most of Kosen Technical Colleges in Japan set up 'Advanced Courses' (two-year advanced engineering courses after the five-year courses) and launched a combined seven-year education system. Students who study at Advanced Courses are conferred Bachelor (Engineering). At present, 40 percent of graduates of the five-year course enter Advanced Courses or Year 3 of universities. Kosen Technical College graduates are said to be given a rich variety of not only job choices but also further education.

- Feature of Kosen Education System in Japan

Kosen Technical Colleges are categorized into higher educational institutes. The purpose of Kosen education is to produce creative engineers with practical and special engineering knowledges and techniques. Graduates of Kosen Technical Colleges (five-year courses) are awarded a title of Associate Degree. Table 4-1 digests the features of Kosen education system.

Table. 4-1 Features of Kosen Education System

Purpose	To produce creative engineers with practical and special engineering knowledges and techniques
Period of Education	five years
Educational System	✓ wedge-shaped arrangements of general education subjects and major engineering subjects ✓ 167 credits to complete the course ✓ 40 students in one class
Title	Associate Degree is conferred to graduates.
Further study	Graduates can enter Advanced Courses or Year 3 of universities.

Kosen education system draws up a curriculum of five-year course to admit 15-year old students with completion of lower secondary education (education of junior high schools). To prepare effective engineering education, Kosen education system adopts a wedge-shaped curriculum arrangement of general education subjects of upper secondary educational level (senior high school subjects, e.g., mathematics, physics, chemistry) and major engineering subjects of university level.

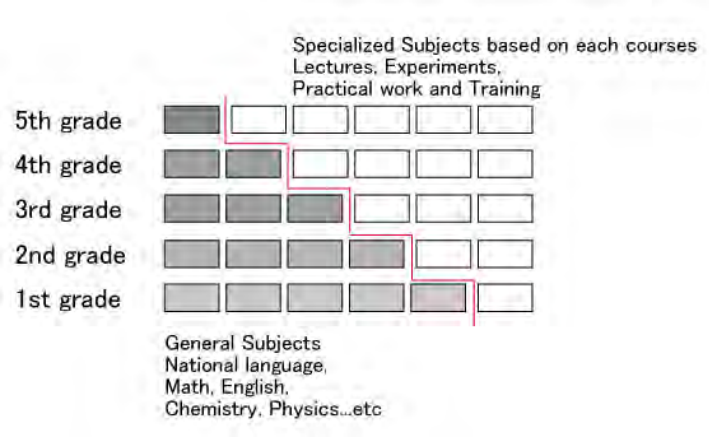


Figure. 4-1 Wedge-shaped Curriculum Arrangement

Besides the classes for the formal curriculum, Kosen Technical College students participate in curriculum activities of their own accord – Robot Contest, Program Contest, Design Contest, etc., which form an important part of Kosen education. Participation in distinctive events such as Robot Contest and Program Contest, at which participant students make up some products by themselves, gives the students experiences of crucial steps necessary for product development (concept creation, design, manufacture, etc.). Through these activities students enhance their abilities such as problem-solving ability or ability to challenge trial and error as well as recognize worth of communication among team members and teamwork.

Figure. 4-2 Design Contest and Robot Contest

The figure below shows results of a questionnaire which National Institute of Technology addressed to 350 companies in Japan asking characteristics of Kosen Technical College graduates.

These two charts, which compare skills of Advanced Course (of Kosen Technical College) graduates and university graduates, point out that the companies estimate the former is higher than the latter except English skill. This questionnaire focuses on skills indicating abilities for professional work, for example, cooperativity, communication skill, problem-solving ability, challenging spirit: it takes long time to cultivate these types of abilities. We may conclude that the results shows clearly fruitfulness of seven-year education from 15-year old (5-year course plus two-year Advanced Course). The reason of weakness of Advanced Course graduates' skill in English compared with university graduates could be explained by saying that Advanced Course graduates were highly engineering-oriented teenagers at the time of graduation from junior high schools and so had less intention to learn English compared with other students who planned to enter universities.

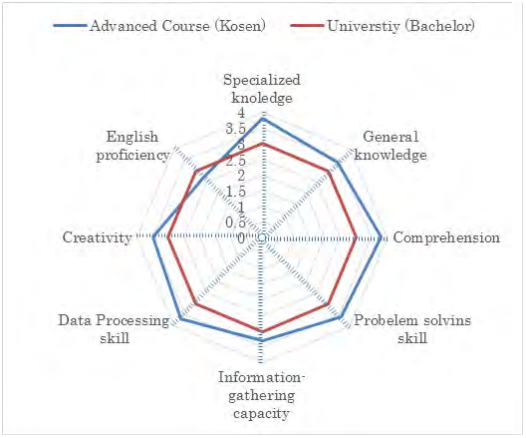


Figure. 4-3 Difference between Kosen Graduates (Advanced Course) and University Graduates

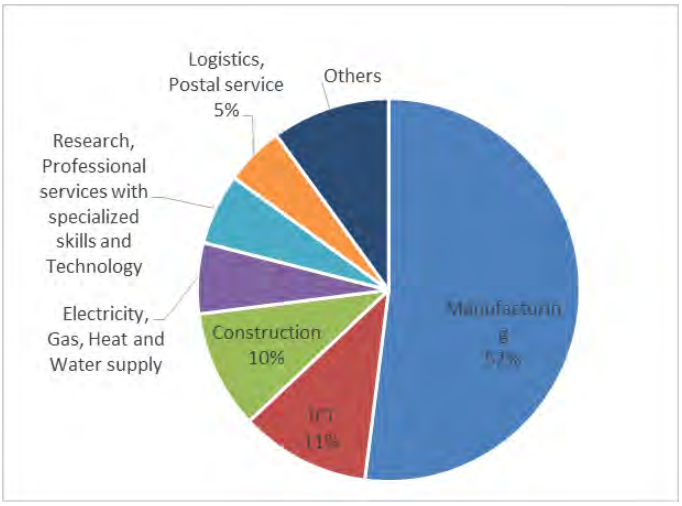
The table below shows that 40 percent of graduates of the five-year course enter Advanced Courses or Year 3 of universities while the rest enter employment immediately (Table 4-2)

Table. 4-2 Kosen Graduates' Courses

Year	Total (a)	Enrollments in university	Job seekers		Enrollments in vocational schools and foreign schools	General jobs	Others	Unidentified / Decease	Enrollment rate (b/a×100)	Employment rate (c+d)/a ×100
			Permanent	Non-permanent						
2005	10,061	4,113	5,413		192	6	337	0	40.90	53.80
2010	10,126	4,506	5,219		155	5	241	0	44.50	51.50
2011	10,155	4,290	5,518		143	7	196	1	52.20	54.30
2012	10,163	3,974	5,848	6	129	5	199	2	39.10	57.60
2013	10,101	3,913	5,845	8	120	3	211	1	38.70	58.00
2014	10,307	4,047	5,934	7	122	4	192	1	39.30	57.60
2015	9,811	3,818	5,717	2	80	0	194	0	38.90	58.30

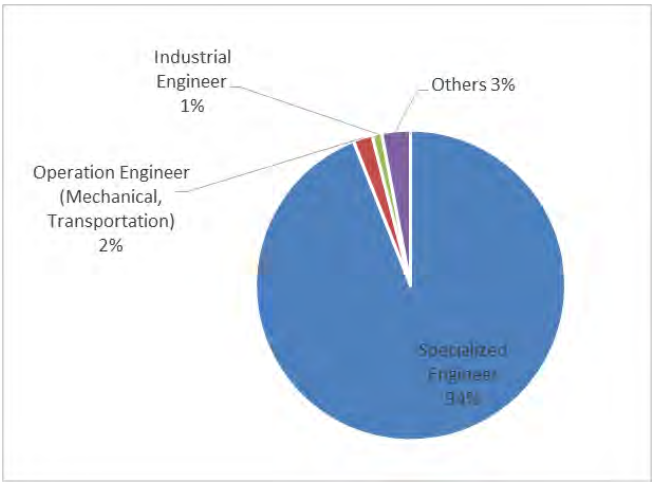
(Source: Based on School Basic Survey, Ministry of Education, Culture, Sports, Science and Technology Japan)

The Figure 4-4 and the Figure 4-5 indicate situation about employment of Kosen Technical College graduates (5-year course) respectively. From the Figure 4-4, showing what kind of industrial sector they have entered, we find that more than 70 percent of the graduates have got jobs in the area of manufacturing, information and communications or construction; From the Figure 4-5, showing what type of occupation they have engaged in, we find that more than 90 percent of the graduates have worked as technical specialists.



(Source: Based on School Basic Survey, Ministry of Education, Culture, Sports, Science and Technology Japan, 2016)

Figure. 4-4 Industrial Sector Kosen Graduates have Entered



(Source: Based on School Basic Survey, Ministry of Education, Culture, Sports, Science and Technology Japan, 2016)

Figure. 4-5 Type of Occupation Kosen Graduates have Engaged in

As above-mentioned, Kosen Technical Colleges in Japan, established as institutes to produce human resources using their knowledges and skills to bolster economic growth up in Japan, have been providing a lot of practical engineers with high level of specialties and techniques and so playing an important part in Japanese industrial development. And we have noted that Kosen graduates have been given a rich variety of not only job choices but also further education recently: 40 percent of 5-year course graduates enter Advanced Course of Kosen Technical College or Year-3 of universities; some of them choose to study further at graduate schools of universities. These graduates have become engineers with characteristics of Kosen Technical College graduates plus higher standard of engineering specialties. Therefore, Kosen Technical Colleges are greatly contributing themselves to rear leading engineers in Japan.

As stated in Chapter 3, there are remarkable prime needs for mid-level engineers mastering special knowledges on product development based on technological innovation or engineers with high abilities of communication, teamwork, self-development, problem solving and so on. This feature of engineers corresponds to what Kosen education in Japan has built up for past 50 years, and hence introduction of Kosen educational system to Mongolia is of great significance. In later sections, we shall see that existing Kosen Technical Colleges were established by people with experiences studying in Japan who foresaw the needs in Mongolia. It would be remarkable to note that the people with challenging spirit and energy who were involved in the establishment are devoting their services to Mongolian industrial development through producing engineers by Kosen education.

4.1.2 Basic Information on Kosen Technical Colleges in Japan through an Example of Sasebo College

In this section, we pick up National Institute of Technology, Sasebo College as an example of Kosen Technical Colleges in Japan, which shows a standard of Kosen education: the number of departments of Sasebo College is four, which is near to the numbers of those of each Kosen Technical College in Mongolia. The comparison of Sasebo College and Kosen Technical Colleges in Mongolia will give view to analyze latter's situation.

Sasebo College is one of national Kosen Technical Colleges established first in Japan in 1962. Although Sasebo College has Advanced Course, we shall not give information about the course for our comparison purpose because Kosen Technical Colleges in Mongolian has not set up Advanced Course yet.

- Departments of Sasebo College

Mechanical Engineering, Electrical and Electronic Engineering, Control Engineering and Chemical and Biological Engineering

Table. 4-3 Number of Students – Sasebo College

867 students（including 5 students from foreign countries）in 2016

	Mechanical	Electrical and Electronic	Control Engineering	Chemical and Biological
Year 5	48	39	44	34

Year 4	36	49	44	49
Year 3	44	47	45	42
Year 2	41	43	44	45
Year 1	43	44	44	42

Number of student quota for each department, each year is 40.

Table. 4-4 Number of Members of Full-Time Teaching Staff – Sasebo College

63 full-time members

General Education	Mechanical	Electrical and Electronic	Control	Chemical and Biological
21	11	10	10	11

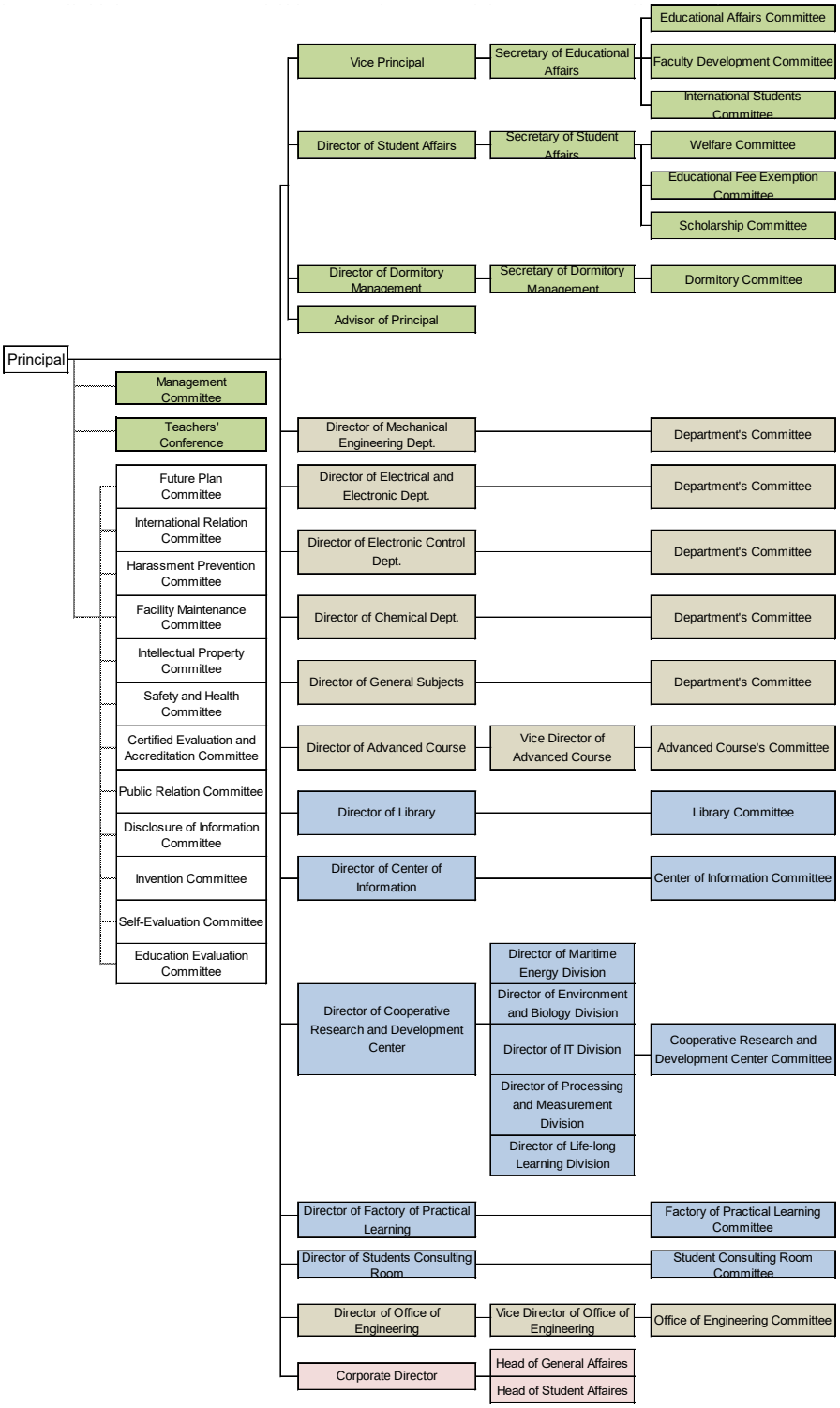
Besides full-time teaching staff, 41 administrative staff are engaged in the college. The administrative office consists of three divisions: General Affairs Division, Student Affairs Division and Technical Education Center. 15 technical officers belong to the Technical Education Center. The technical officers are not only involved in support of student experiment and laboratory activities, maintenance of laboratory instrument, supervision of student reports, management of Information Processing Center and so on, but also conduct special classes for experiment at local primary schools and summer schools for children. They play an active and important role for public relations and interchange with the local community.

- School Dormitories

Inside the campus, there are two dormitories (having separate quarters for males and females) in which about half of students live in the dormitories. Even the students coming from remote place are able to enter Sasebo College due to these dormitories. In the dormitories, senior students belonging to Student Dormitory Council lead junior students and officers in charge of dormitories and teaching staff on duty for the dormitories supervise the whole management.

- Organization

The teaching staff are organized mainly into three sections: Academic Affairs, Student Affairs and Dormitory Affairs. Other than those, there are some sections: Library Committee, Information Processing Center and Student Counseling Office and so on. Each teaching member is assigned to one of these sections alternately about every two years. Besides these sections of teaching staff, the college has an administrative section. Each section is under the Principal: these sections are equal partners without superior-subordinate relationships.



(Retrieved on April 8, 2017 from website of Sasebo College)

Figure. 4-6 Organization of Sasebo College

➢ Example of Graduation Research

Each department consists of laboratories to each of which from one to three teaching members belong. Every Year-5 student is assigned to a laboratory to carry out his/her graduation research. Let us pick up mechanical engineering department to show an example of graduation research. The following table lists each laboratory and theme of its students' research. Generally speaking, in Kosen Technical Colleges in Japan, teaching members are also researchers devoting their efforts to research work as well as teaching. [26] We would like to point out that student research topics are deeply related to their supervisors' research topics.

Table. 4-5 Theme of Graduation Research at Mechanical Engineering, Sasebo College in 2015

Laboratory	Theme of Graduation Research
Material Mechanics	● Study on curved handrail for toilet ● An improvement of pea sorter ● Establishing new technologies to promote realization of hydrogen energy society ● Establishment of protection technology against Hydrogen embrittlement using plasma coating ● Influence of a large amount of hydrogen on fatigue characteristics of metallic materials used in hydrogen energy society ● Improvement of accuracy of ultrasonic test of 12Cr material in rotor for geothermal using heat treatment ● Effect of grain refinement in 12Cr material in rotor for geothermal on corrosion resistance
Machining	● Tooth flank lapping of small module gear ● Tooth surface properties of vacuum carbonitrided gear with surface treatment ● Tooth surface temperature and fatigue damage of heat resistant engineering plastic worm wheel ● Endurance limit of worm wheel for automobile EPS
Mechanical Control	● Stable control of swing up inverted pendulum ● Stabile control of inverted pendulum using disturbance observer together ● Manufacture of experimental equipment of rail less inverted pendulum with damper ● Experimental verification of the motorcycle stabilizing device
Applied Physics	● Inducement of horizontal crack of glass using thermal stress by CO 2 laser (Verification of crack tip position and shape in steady state) ● Development of new removal processing technique of brittle material utilizing laser-induced thermal stress (Verification of optimum processing conditions at tip) ● Phenomenon of Pattern formation induced by small mass pieces rotating in contact

[26] For example, 14 teaching members of Sasebo College are given Grants‐in‐aid for Scientific Research by Japanese Science and Technology Agency. That is to say about fourth of teaching staff are awarded the government grant.

	(Possibility of corrugation in power generation rotary engine)
Thermal Hydraulics	● Influence of reduce of surface tension on generation of liquid droplet in vertical tube gas-liquid annular flow ● Research on micro bubble generator with gas-liquid interface discharge

（Retrieved on April 8, 2017 from website of Sasebo College）

➢ Assessment of Student Results

Although each teaching member has discretion on how to assess students' results, the assessment criterion has to be stated clearly in the syllabus. Many of criteria are that mid-term examination and final examination are weighted with 80 percent, quizzes and assignments 20 percent. A student who gets more than or equal to 60 marks out of 100 marks will be credited successfully.

➢ Condition of Graduation

A student who earns more than or equal to 75 credits out of general education subjects, more than or equal to 82 credits out of engineering subjects and more than or equal to 167 credit totally will be able to graduate successfully.

➢ Internship

During summer holidays in Year-4, students take a subject named 'Factory Training', which is internship activities. The aim of this subject is to develop students' practical abilities and raise up motivation for work through grappling with real problems in factory sites. During the training session, a teaching member in charge of the students visits the site to check the students' activities and advise them if necessary. The students give reports on the training session to the college and make a presentation after their session. Assessment criterion is that evaluation by the factory weighted 60 percent, the student report 20 percent and the presentation 20 percent.

➢ Situation about Employment and Further Study of Graduates (5-year Course)

Out of graduates from 5-year course, about 60 percent are employed by companies immediately, the rest, about 40 percent, enter Advanced Course or Year-3 of universities. Number of March 2016's graduates who are employed is 90, whereas ratio of job offers to the 90 students is 29.3. Number of graduates who enter Advanced Course or Year-3 of universities is 53: out of whom 25 entered Advanced Course of Sasebo College and the rest except one student enter Year-3 of engineering departments and so on of some universities.

➢ Education for Career Development and Support System of Job Search

There are only few subjects specialized to career education because the whole curriculum of Kosen Technical College is originally designed to train practical engineers and also ratio of job offers to graduates is near to 30. However, we would like to pick up a remarkable subject of Year-4, Mechanical Engineering, the name of which is 'Seminar on Development of Fundamental Skills in Society'. The contents of the subjects are small group sessions of English communication with native speakers, teaching explanation about basic

experiment to Year-1 students and teaching how to use machines, session to set and solve problems and so on. This subject aims to develop abilities of communication problem-finding and problem-solving which are required to socialization.

- Recruitment of Teaching Staff and Conditions

Sasebo College employs new teaching members though open recruitment. Doctorate is required to be teaching staff of engineering department or general education department except for liberal arts and physical education.

- Training for Teaching Staff

National Institute of Technology organizes a training camp which newly appointed members of teaching staff of all national Kosen Technical Colleges participate in. They go through group activities (each group is given some topics to discuss) such as discussion and debate. After the activities, a representative of the group makes a presentation to report the activities.

Inside Sasebo College, there is Faculty Development Committee which arranges class observations by each other teaching member, talking sessions inviting outside lecturers etc.

- Entrance Examination and Enrollment

Sasebo College enrolls 40 percent of students by admission based on recommendation and 60 percent by academic examination. As to admission based on recommendation, it assesses the students by junior high school principal's recommendation letter, study records of junior high school and interview. As to academic examination, it assessed through written papers on mathematics, science, Japanese, English and civics (the papers are prepared by National Institute of Technology) and also study records of junior high school.

4.2 History of Kosen Education in Mongolia

For the past 20 years, among about 150 Mongolian people who had studied in Japan was being strong aspiration to set up Japanese type of technical colleges – Kosen Technical Colleges and in 2009 they formed a general incorporated association 'Society for Establishment of Mongolia Kosen' in cooperation with people who are involved in Kosen education in Japan. Later, receiving strong backing from Mr. Luvsannyam Gantumur, former Minister of Education, Mongolia, they established 'College of Technology, Institute of Engineering and Technology' in 2013, followed by 'Institute of Technology, Mongolian University of Science and Technology' and 'New Mongol College of Technology' in 2014. It can be said that in Mongolia Kosen Technical College was set up by people of strong willpower and action who had studied in Japan for seeing Mongolian future industrial development, while in Japan the system was initiated through demand from the industrial area.

As we have seen in Chapter 3, however, at the time of Kosen Technical College's establishment in Mongolia, there were no suitable legislations regarding Kosen Technical College and so the Kosen education started without government endorsement. In fact, Kosen Technical Colleges in Mongolia is in the situation that necessary legal adjustments come after establishment of Kosen Technical Colleges.

4.2.1 Current Situation of Existing Kosen Technical Colleges in Mongolia

In this section, we report current status of t existing Kosen Technical Colleges in Mongolia and also observe some common situations among the three colleges which we can see through a questionnaire to parents of the colleges' students and cooperation between industrial enterprises and the colleges.

4.2.2 College of Technology, Institute of Engineering and Technology

In 2013, College of Technology, which has a popular name 'Mongol Kosen', was established as a school of Institute of Engineering and Technology (IET). This college is managed under Mr. Munkh-Ochir Sergelen, Principal of College of Technology and President of IET, who have experience of studying in Japan. Presently, a former professor at National College of Technology, Tomakomai College and a former professor at National Institute of Technology, Tokyo College are staying as academic advisors.

According to Mr. Sergelen, introduction of Kosen education into Mongolia is aiming not only to produce human resources for industrial area but also to raise the level of higher education in engineering led by Kosen education as a breakthrough in stagnation of improvement of higher education in Mongolia. In other words, Kosen education has been started in perspective of giving favorable influences to university education (national universities and private universities) in Mongolia.

- Departments of College of Technology, IET

Construction Engineering, Mechanical Engineering, Electrical and Electronic Engineering, Biological Engineering

Table. 4-6 Number of Students – College of Technology, Institute of Engineering and Technology

185 students

	Construction	Mechanical	Electrical and Electronic	Biological
Year 5	None	None	None	None
Year 4	24[27]	None	None	None
Year 3	29	22	31	None
Year 2	16	12	24	7
Year 1	20 (all Year-1 students make up one class)			

Table. 4-7 Number of Members of Teaching Staff – College of Technology, IET

22 members (including 5 part-time members (one: general education, four: engineering))

General Education	Construction	Mechanical	Electrical and Electronic	Biological
1	2	1	3	2

[27] Model class sided by the Sasakawa Peace Foundation

- Organization
- College of Technology, IET has been organized as shown in the Figure 4-7. Compared with Kosen Technical Colleges in Japan, the head of academic affairs is given broader power, under whom administrative officers are placed. As we saw an example of Sasebo College, Kosen Technical Colleges in Japan have a system to avoid concentrating power on one section: the teaching staff are organized into Academic Affairs, Student Affairs and Dormitory Affairs, Library Committee, Student Counseling Office and so on and each teaching member is assign to one of these sections alternately about every two years. In case like College of Technology, IET that every section is placed under the head of academic affairs, there is a risk such that heavy responsibilities burdens the head of academic affairs and it takes too long time to make decisions.

- Curriculum and Syllabus

Curriculum and syllabus for general education, construction engineering, mechanical engineering and electrical and electronic engineering are drawn up following those of Tomakomai College, while biological engineering follows Okinawa College and Sasebo College. They are arranged to be adapted for Mongolian educational standard not transplanting Japanese curriculum and syllabus directly. The reader can get detailed information from the following websites:

- ✓ for Construction Engineering
  http://www.tomakomai-ct.ac.jp/dep/syllabusdetail?type=k
- ✓ for Mechanical Engineering
  http://www.tomakomai-ct.ac.jp/dep/syllabusdetail?type=m
- ✓ for Electrical and Electronic Engineering
  http://www.tomakomai-ct.ac.jp/dep/syllabusdetail?type=a
- ✓ for Biological Engineering
  http://www.okinawa-ct.ac.jp/detail.jsp?id=73428&menuid=14392&funcid=1
  http://www.sasebo.ac.jp/education/syllabus.2014/view/index.cgi

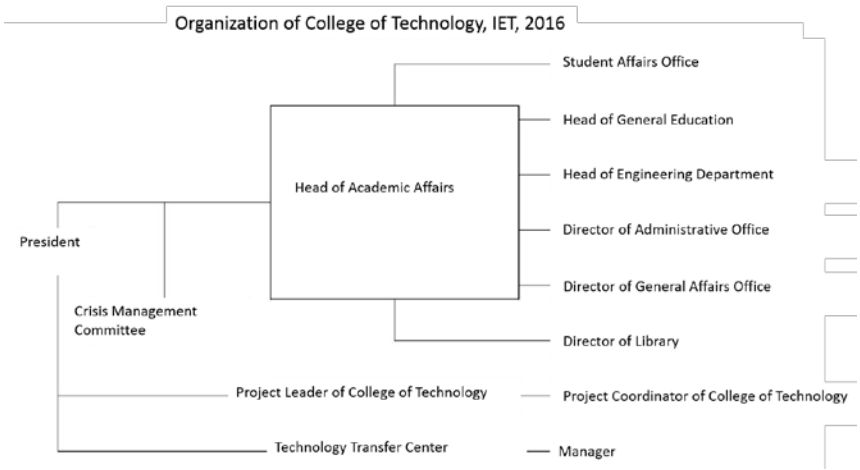


Figure. 4-7 Organization of College of Technology, IET

➢ Textbooks

No textbooks have been distributed to students. Each teaching member refers to Japanese textbooks and reference books which are cited in the syllabus mentioned above. As to general education, they refer high school textbooks used in Mongolian high schools.

➢ Laboratory Instruments for Education

Mitsui Chemicals, Incorporated donated their used instruments to College of Technology, IET.[28] College of Technology, located inside IET university campus, can utilize facilities of the university as well as instruments belonging to College of Technology, which means that this college possesses the most favorable educational environment to handle laboratory work smoothly among existing Kosen Technical Colleges. While list of the instruments has been too short for demand now, it is equipped at least with the following items. We note that there are no technical officers; teaching staff is involved in the maintenance work.

- lathe
- drilling machine
- universal testing machine (50 tons)
- set of apparatus for content and density test of soil
- outfit for sieve-analysis test
- set of apparatus for consistency test of soil
- E-station
- gas chromatographer
- high-performance liquid chromatographer

Figure. 4-8 Drilling Machine Donated by a Japanese company

➢ Assessment of Student Results

Table 4-8 and 4-9 below show allocation of marks for student result assessment and relations between marks and grades, respectively. The allocation varies according to student year: for Year 1, overall class contribution weighted 70 percent and examination weighted 30 percent; for Year 2, 60 percent and 40 percent and for Year 3 and above, 50 percent and 50 percent, respectively. The grading system, as stated in Table 4-9, has five grades, in which students with D and above are credited.

[28] The cost of freight and customs are borne by IET.

Table. 4-8 Allocation of Marks for Student Result Assessment – College of Technology, IET

	Overall class contribution			Examinations	
Year 1	70%			30%	
	Attendance 10%	Assignment 30%	Quiz 30%	Mid-term 15%	Final 15%
Year 2	60%			40%	
	Attendance 10%	Assignment 20%	Quiz 30%	Mid-term 20%	Final 20%
Year 3 and above	50%			50%	
	Attendance 10%	Assignment 20%	Quiz 20%	Mid-term 25%	Final 25%

Table. 4-9Grading System

Grade	Marks
A	90-100
B	80-89
C	70-79
D	60-69
F	59-0

- Condition of Graduation

Following the condition of Tomakomai College, a student who earns more than or equal to 81 credits out of general education subjects, more than or equal to 86 credits out of engineering subjects will be able to graduate successfully. Moreover College of Technology, IET is planning to set graduation research as a compulsory subject to graduate. The theme for students of Model Class (Year 4, Construction Engineering) are supposed to be based on internship activities or development of laboratory instruments related to a social infrastructure (roads, bridges, resistance to seismic shocks) or environment.

- Internship

College of Technology, IET is planning internship for students belonging to Model Class in Mongolia and Japan from June to August 2017. With help of teaching staffs in Japanese Kosen Technical Colleges, it is expected to find Japanese companies operating in Mongolia or Mongolian companies. And also it is looking for companies in Japan with the aid of National Kosen Cooperation. A former professor at Tomakomai College who has been staying at College of Technology, IET from 2013 is undertaking a mission to start up internship as well as advise local teaching staff on lectures.

➢ Education for Career Development and Support System of Job Search

In 2017, College of Technology, IET will set up a committee for support of student job search and will start their task for students at Model Class (Year 4). It has relationship with 150 companies as its cooperative companies: 90 percent are small and medium-sized enterprises and 10 percent large enterprises; as for sectors, 50 construction companies, 30 road companies, 30 food processing companies or catering companies. College of Technology, IET has plan to use relationship that will be formed through internship in order to find job places for its graduates.

➢ Japanese Language Education

College of Technology, IET installs Japanese language subjects as compulsory subjects for Year 1, Year 2 and Year3. One of the reasons that it has Japanese language classes is because it plans to send some students to Japan for their internship activities. Especially, it conducts more Japanese classes for Year 3. The following table shows how many slots are allocated for Japanese language education a week (one slot has 40 minutes length)

Table. 4-10 Number of Slots Allocated for Japanese Language Education a Week – College of Technology, IET

	number of slots
Year 1	3
Year 2	2
Year 3	4

➢ Recruitment of Teaching Staff and Conditions

College of Technology, IET recruits teaching staff by interview and written examinations on applicants' special fields under Crisis Management Committee. The present committee consists of President, Head of Academic Affairs, Head of Student Affairs, Head of General Education, Head of Engineering Education, Director of Administration and Project Coordinator. Basically, it has open recruitment via internet but, if necessary, conduct employment test based on recommendation.

➢ Condition to be Teaching Staff (specialties, degrees)

Currently, it has not set up condition on degrees to become teaching staff. But to become teaching members of general education, teacher's license is required. Once standards for establishing a Kosen Technical Colleges in Mongolia have been settled, at least Master Degree or sufficient experience in engineering fields will be required.

➢ Training for Teaching Staff

In each year, about five teaching members get two to four weeks' training at Kosen Technical Colleges in Japan. Out of five, three members take country focused training implemented by the Japan International

Cooperation Agency (JICA) and two members join training implemented by the Sasakawa Peace Foundation. The country focused training sessions by JICA has already conducted three times and teaching members who have joined the sessions utilize what they had learned in Japan for their lecture and teaching of experiment/laboratory work after report sessions.

- Entrance Examination and Enrollment

College of Technology, IET conducts examinations on mathematics and craftsmanship, essay and interview for enrollment of new students. The examination craftsmanship came to be conducted based on a request by advisors who were teaching staff of Kosen Technical Colleges in Japan. (Refer to Appendix 10).

4.2.3 Institute of Technology, Mongolian University of Science and Technology

In 2014, Institute of Technology, Mongolian University of Science and Technology was established under supervision of Mr. Ganbayar Aleksei, who had studied at a Kosen in Japan, as ninth school belonging to MUST. However, for the time of starting up, it belonged to Department of Education. Being under Department of Education allows easiness to secure teaching staff and class rooms. At the moment when we surveyed its situation, a newly formed working group to make the institute independent had a plan to reorganize MUST from 2017. Under current circumstances, the right of personnel management is owned by the President of MUST; after the reorganization, the right will come to Institute of Technology, Mongolian University of Science and Technology itself, bringing a merit such that the institute will be able to make an appraisal of teaching staff or faculty development activities for its sake. After the reorganization, it will have to budget on a self-paying basis from tuition fees; the cost for purchase of laboratory instruments will be unable to be covered only by income from the tuition fees. As a specific feature of Institute of Technology, Mongolian University of Science and Technology, we can point out that it draws up a curriculum so that the students can enter Year 3 of MUST.

- Departments of Institute of Technology, Mongolian University of Science and Technology

Electrical and Electronic Engineering, Civil and Architecture Engineering, Mechanical Engineering

Table. 4-11 Number of students – Institute of Technology, Mongolian University of Science and Technology

146 students

	Electrical and Electronic	Civil and Architecture	Mechanical
Year 5	None	None	None
Year 4	None	None	None
Year 3	24	25	None
Year 2	26	27	16
Year 1	28 (all Year-1 students make up one class)		

As a remark, we note that some students, on coming to the end of Year 3, seem to sit for the Mongolia national examination at graduation of secondary education and move to a program which gives preparatory education to enter Year 3 of Kosen Technical Colleges in Japan – a component of Higher Engineering Education Development Project Mongolia (MJEED).

Table. 4-12Number of Members of Full-time Teaching Staff – Institute of Technology, Mongolian University of Science and Technology [29]

8 full-time teaching members

General Education	Electrical and Electronic	Civil and Architecture	Mechanical
7[30]	None	1	None

At present, the right of personnel management is owned by the President of MUST and these teaching members are directly employed by the President, that is, Institute of Technology, Mongolian University of Science and Technology does not recruit teaching staff.

Besides the full-time members, there are 27 part-time lecturers. Except one biology teacher coming from the 33rd secondary school, all part-time members are invited from MUST. Since the institute has only one full-time teaching member for engineering education, who has research experience at Miyakonojo College, almost all engineering subjects are taught by part-time lecturers. Indeed teaching staff of MUST, as part-time lecturers at the institute, handles most of classes in engineering for Year 2 and above based on syllabus of the institute.

- Organization[31]

Institute of Technology, Mongolian Science and Technology has been organized as shown in the Figure 4-9. The Table 4-11 shows roles of Program Sub-Committee and Meeting for Pedagogy. We note that there are not sections corresponding to Student Affair Section or Student Counseling Office in Japanese Kosen Technical Colleges. It can be said that the institute needs refinement of organization.

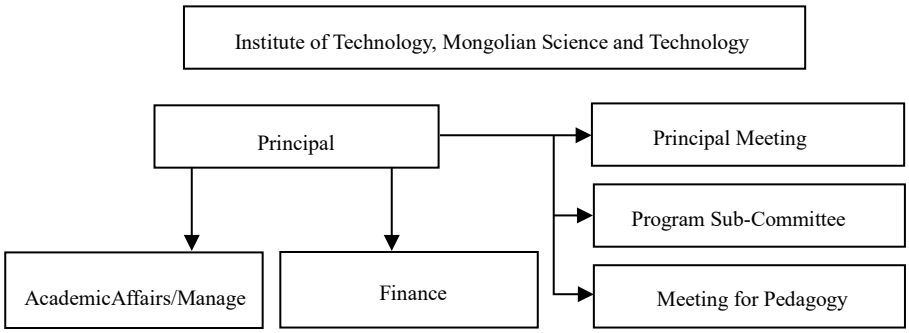


Figure. 4-9 Organization of Institute of Technology, Mongolian Science and Technology

[29] At present the teaching staff is employed directly by President of MUST who possesses the right of personnel management.
[30] Mathematics: 2, Physics: 1, Chemistry: 1, Mongolian lLiterature: 1, Information Processing: 1, Japanese Language: 1
[31] This organization is the one as an independent school, which will be achieved through reorganization of MUST.

Table. 4-13Roles of Program Sub-Committee and Meeting for Pedagogy

	Name of Section	Background	Members	Role
1	Program Sub-Committee	- Need for appropriate supervision to implement Kosen education - Shortage of teaching members with high level degrees	members from other educational institues of MUST	Supervision, Evaluation, Advice
2	Meeting for Pegadogy	- Need to conduct general education and engineering education as a higher educational institute	Teaching staff of Institute of Technology, Mongolian Science and Technology and members from other educational institues of MUST	

- Curriculum and Syllabus

Curriculum for electrical and electronic engineering is being drawn up and refined following that of Sendai College, curriculum for civil and architecture engineering following that of Tomakomai College and curriculum for mechanical engineering following Sasebo College. As an example of curriculum, we put curriculum for electrical and electronic engineering as Appendix 11. As to syllabi, they are modeling syllabi following those of Ibaraki College. The reader can get detailed information from the following websites:
http://www.ibaraki-ct.ac.jp/wp-content/themes/ibaraki-ct/syllabus/2015/syllabus_en/index.html

As a characteristic feature of this institute's curriculum, active learning is noteworthy: it conducted educational trials such as activities for Year-1 students of making truss structures using toothpicks in 2015 and of figuring out an object to carry and protect an egg which will not be broken even if the object falls from second floor using only A4 size paper and stapler. This kind of hands-on activities are expected to be helpful for learning theories later.[32] Apart from these activities, students built electromagnetic wave reflectors and took part in a Japanese scientific project 'Constellation of the Earth' after learning theory of electromagnetic waves[33].

Institute of Technology, Mongolian Science and Technology, having introduced a mini-computer named 'Ichigo-Jam'[34] with cooperation of Fukui College, conducted classes to make line tracers[35] controlled by the mini-computers. There does not seem to be this type of active learnings at curriculum of bachelor course of MUST.

[32] Truss structure is taught to Year-3 students.
[33] A scientific and art project to draw geoglyph using reflectors and an artificial satellite.
[34] A programmable small computer which can be assembled by soldering.
[35] A small car which automatically moves along with a curve drawn on the floor. Students can learn control theory through making line tracers.

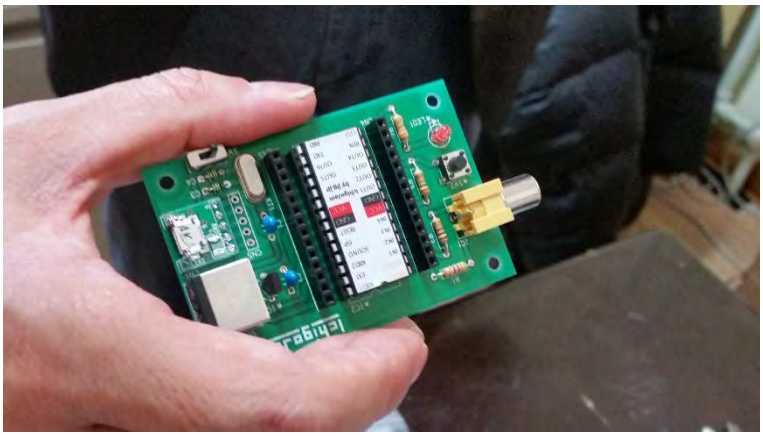


Figure. 4-10 Example of Active Learning (Ichigo-Jam)

➢ Textbooks

No textbooks have been distributed to students. Each teaching member refers to Japanese textbooks and reference books which are cited in the syllabus. For example, they refer to 'New Mathematics for Kosen, Third edition, Second printed'.[36]

➢ Laboratory Instruments for Education

Institute of Technology, Mongolian Science and Technology prepared a list of laboratory instruments needed to carry out student experiments and laboratory work for the first three years when it started its program and it has already obtained technical advice from National Institute of Technology, Japan. Therefore, we would say that Institute of Technology, Mongolian Science and Technology has the most advanced procurement plan compared with other Kosen Technical Colleges in Mongolia. Unfortunately, however, it has no buildings (experimental or laboratory buildings) in which large or heavy machines can be installed. By means of non-project grant aid of Japanese government, it is supposed to be donated equipment valued 200 million Yen and has already drawn up the procumbent plan for electrical and electronic engineering, civil and architecture engineering and mechanical engineering. The equipment for electrical and electronic engineering have already been delivered (refer to Appendix 12). A stock of fittings for the machines have been given by Japan and will last several years. Small equipment for civil and architecture engineering are kept by the institute. Although large or heavy machines will come in 2017, any information has not been enclosed due to timing of bidding. Besides the non-project grant aid, some used equipment have been donated by general incorporated association 'Association for Establishment of Kosen Colleges of Japanese-type in Mongolia'.

At present, 10 percent of the total plan's equipment have arrived. Other matters related to laboratory are as follows.

- ✓ It is difficult for Institute of Technology, Mongolian Science and Technology to employ technical officers due to restriction of budgets. Hence supports from technical officers of MUST will be needed for maintenance of the equipment.

[36] A standard textbook for mathematics in Kosen colleges in Japan.

- ✓ Institute of Technology, Mongolian Science and Technology rents laboratories from MUST.
- ✓ To handle a class for information processing it use computers belonging to high school, MUST.
- ✓ It seems to be difficult to furnish equipment fully by the time when the first students start their graduation research two years later. Institute of Technology, Mongolian Science and Technology is considering using facilities of MUST or asking Kumamoto University and Nagaoka University of Technology for help to send necessary used equipment. (Even if it can secure the equipment, it will have to seek places to put them.)
- ✓ Institute of Technology, Mongolian Science and Technology considers installing large or heavy machines (lathe, universal testing machine, etc.) which are expected to be delivered by the scheme of non-project grant aid into the building of Faculty of Management after renovation of the building. But it is still not sure of how it can raise the necessary budget for the renovation.
- ✓ In case that it is impossible to renovate buildings or share the space with MUST, it must take account of putting the machine in other two Kosen Technical Colleges. [37]
- ✓ Institute of Technology, Mongolian Science and Technology considers sharing its machine and equipment with other two Kosen Technical Colleges because of the others' stagnant procurement plans.
- ✓ Experiments of brushless motors and thyristors have been conducted, which are rare among higher educational institutes.

（Equipment are put in a normal classroom because there are no experimental rooms.）

Figure. 4-11　Scene of Experiment

➢ Assessment of Student Results

Basically, assessment method is the same as those of other two Kosen Technical Colleges in Mongolia.

➢ Condition of Graduation

[37] Note that there is a space in which large and heavy machine can be put on the basement level of New Mongol College of Technology.

Following the condition of Kosen Technical Colleges in Japan, a student who earns more than or equal to 167 will be able to graduate successfully. Moreover Institute of Technology, Mongolian Science and Technology is planning to set graduation research as a compulsory subject to graduate. It considers sending the students to Japan to complete their graduation researches for the first several years until experimental environment is created (enough number of teaching members and sufficient equipment)

- Internship

Institute of Technology, Mongolian Science and Technology arranges factory tours to show the students real work of engineers before a new semester starting in September. It also has a plan of full-scale internship to be conducted in Shinagawa, Japan (refer to Appendix 13).[38] And also it considers asking cooperatives of Kosen Technical Colleges in Japan through the liaison office of National Institute of Technology to introduce companies which will accept the students.

- Education for Career Development and Support System of Job Search

Although Institute of Technology, Mongolian Science and Technology has not set up a section for support of students' job search yet, it considers targeting companies which will accept the students as interns or the companies affiliated with National Kosen Cooperation. Besides such companies, it anticipates possible future to send its students to companies in Japan having useful contacts through business seminar. In fact, in November 2016, five major construction companies affiliated with National Kosen Cooperation hosted a business seminar in Tomakomai.

Moreover, Institute of Technology, Mongolian University of Science and Technology considers job support in cooperation with Mongolia Chamber of Commerce and Industry, which has some agreement with MUST. It plans to invite Mongolia Chamber of Commerce and Industry to a business seminar to be held in Japan in 2017.[39]

- Japanese Language Education

As formal curricular classes, two slots (one slot: 90 minutes) are allocated to Japanese language a week. On the other hand, some students learn Japanese at Mongolia-Japan Center for Human Resource Development after school, who have intention to shift to MJEED program which gives preparatory education to enter Year 3 of Kosen Technical Colleges in Japan. Among these are several students with Japanese proficiency who consider entering 'Fast Track'- a course in MJEED providing a route to enter Year 3 of Kosen Technical Colleges in Japan without preparatory education in Mongolia (refer to Chapter 5 for the Fast Track).

[38] There are few electrical and electronic companies in Mongolia at present. It is necessary to consuct internship abroad at least until the industrial area has grown.
[39] Mongolia Chamber of Commerce and Industry has personnel in charge of universities and educational institutes.

- Recruitment of Teaching Staff and Conditions

Department of Education, MUST invites applicants for teaching staff publicly who meet the condition Institute of Technology, Mongolian Science and Technology lays down. At present, the right of personnel management is owned by the President of MUST.

- Condition to be Teaching Staff (specialties, degrees)

The conditions to be teaching staff are at least Master Degree holder with Japanese or English proficiency, or Professional Engineer with Japanese or English proficiency.

- Training for Teaching Staff

As stated above, the current situation is that the right of personnel management is owned by the President of MUST not by Institute of Technology itself which is under Department of Education, MUST, which is a reason why Institute of Technology, Mongolian Science and Technology has been facing difficulties about offer of its own training program for the teaching staff on faculty development.

- Entrance Examination and Enrollment

Institute of Technology, Mongolian Science and Technology prepare questions of entrance examination referring to questions of Japanese Kosen Technical Colleges' entrance examination accumulated for the past 10 years as a guide. Tuning of the Japanese Kosen Technical Colleges' questions contents is needed because curriculum of Junior high schools in Mongolia is different from that in Japan: in Mongolia junior high school students learn less of geometry classes than Japanese junior high school students (refer to Appendix 14).

4.2.4 The Current Situation of New Mongolian College of Technology

A private school corporation, the "New Mongol College of Technology" was founded in 2014. The New Mongolian Institute is composed of elementary school to university. The institute was operated under Principal Buyangalgar who has previous experience of studying abroad in the Japanese College of Technology. Since its establishment, universities and colleges of technologies have been operated using the same operational costs, but universities and college of technologies started operating independently since 2017.

A vision of "Moving towards the Path to Independence", and "Career Education" is the most enriching among those three Colleges. The plan of Teaching Training also proceeded accordingly.

According to Principal Buyanjargal, the reason for introducing the College of Technology System was that even though the natural resources are available in Mongolia, human resources are not being fully developed and in the case of Japan, its' success come from the processing trade where engineers play a pivotal role. The Principal has come up with the idea or establishing an appropriate educational system that can develop engineers by utilizing his previous experience as a student of the College of Technology in Japan.

- Department's Composition

Civil Engineering and Architecture Department, Electrical and Electronics Engineering Department, Mechanical Engineering, Chemical Engineering Department

- Number of Students

All first year students will enroll in a common set of courses during their first year, and then be divided by their major in the second year. It begins with an engineering pre-major, where the first-year students will be taught a solid base of fundamental concepts to all areas of engineering (8 weeks per major) before selecting an engineering major during second year.

Table. 4-14Number of students – New Mongolian College of Technology

242 students

	Civil Engineering & Architecture Department	Electrical and Electronics Engineering Department	Mechanical Engineering	Chemical Engineering Department
Year 5	None	None	None	None
Year 4	None	None	None	None
Year 3	30	31	27	
Year 2	31	30	23	28
Year 1	42（2 Class; each class consisting of 21 students）			

- The Number of Lecturers

Table. 4-15Number of Lecturers – New Mongolian College of Technology

Total: 21

General course	Civil Engineering & Architecture Department	Electrical and Electronics Engineering Department	Mechanical Engineering Department	Chemical Engineering Department
16[40]	2	None	1	2

- Part-time Lecturers Total:4

Two part-time lecturers of Civil Engineering & Architecture Department were invited from corporations. One part-time lecturer of Electrical and Electronics Engineering Department and one young part-time lecturer

[40]Mathematics: 4,Physics:2,Biology: 1,History:1,Mongolian language: 1,English:2 ,Japanese Language:3,Physical Education:2

hired for Mechanical Engineering Department. Among two part-time lecturers hired from the corporations, one of them is a Japanese lecturer hired as a Civil Engineering Lecturer[41].

- Organization

Figure 4-12 shows an overall structure of this organization but as of January 2017, it has not been implemented yet. For instance, administrative staffs for College of Technology have not been selected yet. Presently, lecturers are divided into the following 5 teams.

I. Homeroom Teacher
II. Activities, Innovations & Internal Activities Monitoring
III. Machinery, Equipment & Technology
IV. Accreditation & Education Personnel
V. International exchange & Promotion

[41]In Mongolia, Civil Engineering experts are insufficient

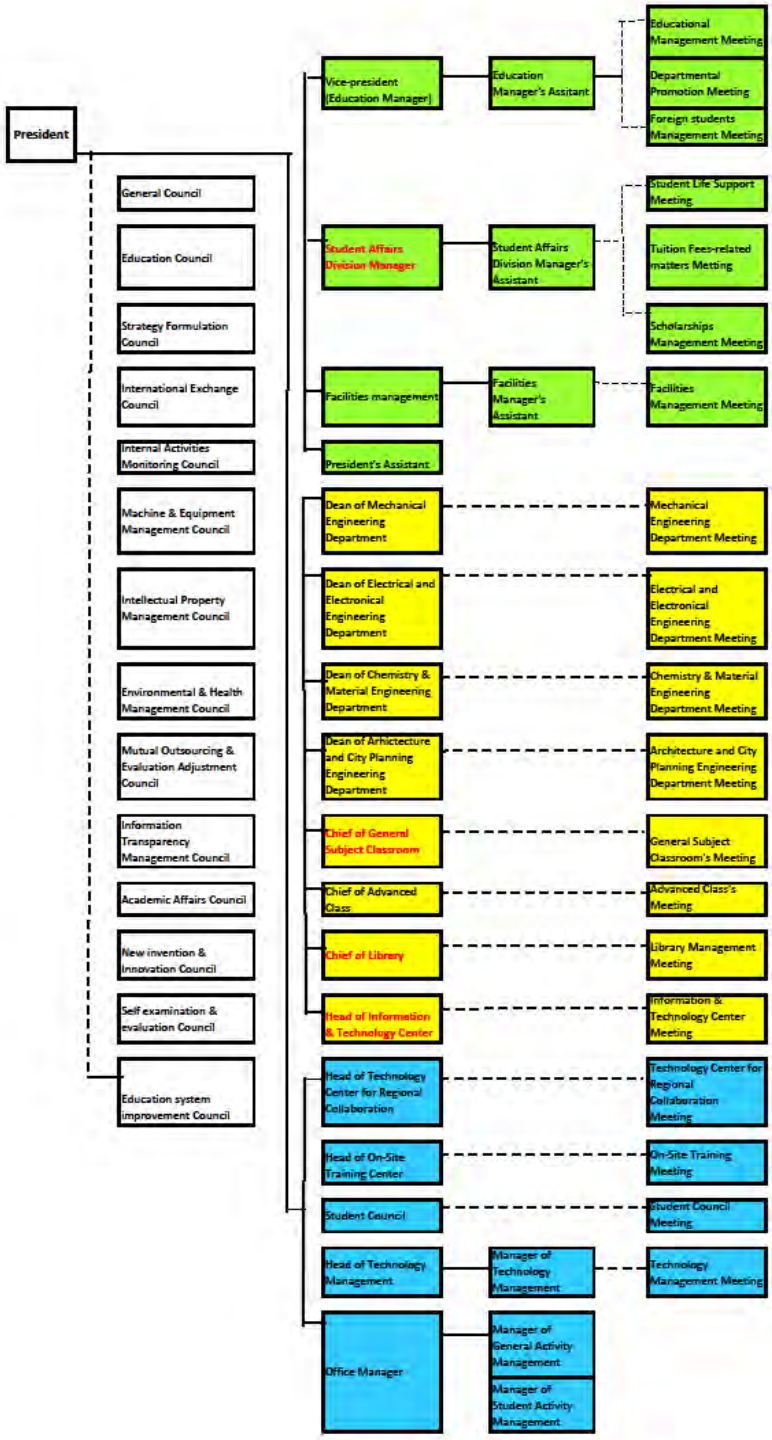


Figure. 4-12 The New Mongolian College of Technology Organizational Chart

- Curriculum & Syllabus

The curriculum is complete as shown in the curriculum of the Mechanical Engineering Department in Appendix 15. Tokuyama National College of Technology was taken as a model for composing the syllabus. General subjects and specialized subjects are available in the Japanese version; the syllabus of the specialized courses being translated by the lecturers of specialized courses.

A survey on the necessary skills of a civil engineer has been completed by 70 participants from 20 major construction companies. As a future reference, the gathered data will be used for creating a curriculum and syllabus.

- Textbooks

Mongolian high school textbooks are partly being used in general subjects where the students purchase the textbooks by themselves. Additionally, the lecturers refer[42] to Japanese textbooks for subjects that exceed the Mongolian high school educational level. The exercises are created by referring to the Japanese National College of Technology's textbooks.

Lecturers of the specialized subjects such as Electrical and Electronics Engineering, Mechanical Engineering and Chemical Engineering refer to the English materials to prepare for the lessons and handouts and then send them to the students via email. Meanwhile, for the Civil Engineering & Architecture Department, Japanese textbooks are being applied.

- Materials and Laboratory Equipment

For general subjects, Physics laboratory and Chemistry laboratory have already been set in place where the students from first to third year have been conducting experiments while laboratories and equipment for specialized subjects are still insufficient. Appendix 16 shows the equipment utilized for specialized subjects which most of them are measuring instruments and tools; making it the least materials-sufficient among those 3 College of Technologies. However, there is a school basement in the new Mongolian College of Technology building where large equipment can be placed (Please see footnote 51). There is a possibility that this large space can be utilized effectively as a site for sharing large equipment with the other two colleges of technology.

[42] For instance, the third year students' Mathematics level matches with the Universities level so the textbooks from High School cannot be used. The lecturers are referring to the Japanese textbooks.

➢ Results Evaluation Method

The method of evaluating grades for general subjects adapts the common evaluation method while the evaluation method for specialized subjects is still under consideration. Also, the assessment of attendance rate [43]system such as JABEE[44] will be excluded in the future. The grading scores are calculated as follows:

Table. 4-16Evaluation Criteria of the New Mongolian College of Technology

Grade	Score
A	90-100
B	80-89
C	70-79
D	60-69
F	59-0

➢ Graduation Requirements

The implementation of Project Based Learning (PBL) with corporations during the 5th year while considering to integrate graduation thesis at the same time.

➢ Internship

Internships are held once a year during summer holiday for the first year students to third year students. During the first and second year, 10 students are selected from each class for internships through industrial visit to factories. Meanwhile, during the third year, 5 students will be chosen from each class for vocational experience through one-week internship program. A committee has been established aimed to foster participations from companies who will be willing to provide internship opportunities to the students and the New Mongolian College of Technology is also putting its efforts to find companies willing to cooperate in the internship program.

➢ Career Education & Employment Support System After Graduation

Regarding career education, the most advanced efforts among existing Kosen Technical Colleges are currently being implemented. First of all, the students will self-analyze in the first and second years. Next, career counseling will be carried out (about 3 times of personal interviews in a year) during the 3rd year after undergone internships from the 1st year to the 3rd year. During 3rd year, students will decide and select more specific fields (For example, in the case of chemical engineering, specializing either in biotechnology or specializing in materials engineering). Additionally, lessons to foster and encourage more business-minded students are conducted during 3rd year.

[43] The attitude towards learning is also included in the evaluation.
[44] JABEE stands for Japan Accreditation Board for Engineering Education. JABEE accredits professional education programs in higher education institutions fostering professionals with benchmarks required by the society which is internationally equivalent. The experts for the Japanese College of Technology have been certified.

Currently, we have partnered with Mongolian enterprises listed in Appendix 17, and we are preparing to provide support for the employment system held in two years.

- Japanese Language Education

4 periods of 45 minutes Japanese lessons for the 1st year students, 7 periods of 45 minutes Japanese lessons for the 2nd year students, and 4 periods of 45 minutes Japanese lessons for the 3rd year students. Intensive Japanese lessons are also open. Excellent students passed the Japanese Language Proficiency Test Level N3 during 2nd year and passed Level N2in the 3rd year. Since they will be transferred to the College of Technology into the 3rd year undergraduate students, Japanese lessons are being increased as the time of overseas transfer approaches. (In Mongolia, the semester starts in September)

- Teacher Recruitment Method

The information about the job recruitments are advertised online as well as on the newspapers. For the specialized subjects teaching position, having study abroad experience is desirable. However, the conditions may vary according to the Department. For instance, while Civil Engineering and Architecture Department requires teachers who have previous practical and operational experiences, having a lot of knowledge is a requirement for teaching position in Electrical and Electronic Engineering Department.

In the case of employing a Japanese teacher, the amount of the salary is similar to that of Mongolian teachers and accommodation will be covered. Interpreters will be assigned if necessary[45]. (Japanese people who had taught as Japanese teachers until 2015 were employed as interpreters)

- Teacher Recruitment Qualifications (Specialized Fields and Education Level)

A bachelor's degree is the minimum requirement for General Subject's teacher. Meanwhile, specialized subjects' teachers hold at least a master's degree and whom also possesses English or Japanese language skills. A Professional Engineer[46] who possess English or Japanese language skills are also applicable.

- Teacher Training System

5 lecturers have been sent to Japan to undergo training under JICA. It was found that the teachers' level of awareness after undergoing training in Japan have changed positively. Besides that, visits observing lessons are held mutually among teachers where general subject teachers can observe the lessons contents of specialized subjects for references while the Japanese teachers can grasp the necessary terms of specialized subjects through this visitation.

As an organizational effort, the school-based training program is currently under consideration. A rubric evaluation table which was prepared by disassembling the necessary capacities of high school teachers into viewpoints and levels was prepared (Annex 18). If this system is realized, it can be said that it could be a training system comparable to the system of the Japanese college of technology.

[45] The Japanese language lecturers and the Japanese staffs in the new Mongolian Institute will assist.
[46] Currenltly, there is no professional engineer teaching at the College.

➢ Entrance Examination Screening Method

Entrance examination for Mathematics, Physics and Chemistry consists of written examinations and interviews and the successful candidates have scored with minimum scores of 10 to 50 up to now. The aim is to raise acceptance rate threefold during 2017 entrance examination.

4.2.5 Common situations of Existing Kosen Technical Colleges in Mongolia

1）Questionnaire to parents whose children go to Kosen Technical Colleges in Mongolia

We carried out an investigation using a questionnaire for the parents whose children go to the three Kosen colleges in Mongolia to find how the colleges are being evaluated and also what problems are going on (Refer to Attached 19).

From the answers to the questionnaire, almost all the parents came to know of Kosen through internet/mass media, or friends/acquaintances. Only eight percent were given information by junior high schools, which are supposed to play a central role as advisors about students' choices of school primarily.

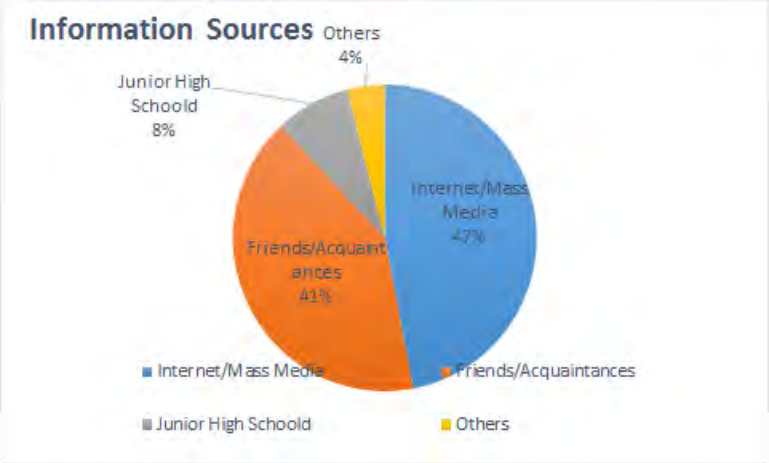


Figure. 4-13 The Source of Information of Kosen Technical Colleges in Mongolia

52 parents have positive feeling or opinions about their choices. The following are notable answers.

- ✓ Their children's sense of responsibility or autonomy has been developed (Answers about character building from 10 parents).
- ✓ Their children's abilities of time managements or self-control have been grown (from four parents).
  - ✧ However we find the minority voices as follows. (Each answer was given by one parent respectively.)
- ✓ Total system of the school including quality of education should be developed to level of Japanese Kosen colleges once Mongolia introduces Japanese type of Kosen education.
- ✓ Though expecting the children will become high level engineers, it is not sure that existing Kosen Technical Colleges are conducting education modelled after Japanese Kosen.

- ✓ The image of Kosen is different what the parent had. Educational environment is not in good condition. Shortage of teaching staff is serious.

2）Business-Academia Collaboration

The existing Kosen Technical Colleges are at the stages to start research by teaching staff and so industry-academia collaborations should be their future targets. At the present stage, they have just started collaborations with companies on students' job seeking, internship, project based learning. We summarize the present situation as follows.

2-1）Collaboration with Mongolian National Association of College of Technology

- ➢ Business Exchange Meetings in Japan

As stated in Chapter 3, National Kosen Cooperation was established to support collaboration among existing three Kosen in Mongolia and Mongolian industries. We note that in the cooperation group, five major construction companies in Mongolia participate. The first business seminar was held in Tomakomai in November 2015. Although the second seminar was expected to be held in Kumamoto University in November 2016, it was unfortunately cancelled due to some reason of Mongolian side, which was a side effect of the ruling party through the general election in June 2016.

- ➢ Cooperation with Shinagawa Ward, Tokyo

Referring to the section on internship plan of Institute of Technology, Mongolian University of Science and Technology (4.2.3), student internship is being planned through collaboration with manufacturers in Shinagawa Ward, Tokyo, Japan as a cooperative work for human resources development between the three Kosen colleges in Mongolia and Shinagawa Ward, Tokyo. From August to September in 2017, some metal processing factories and plastic processing factories will be accepting ten Mongolian Kosen students to give them training for about eight days. There are also plans of student study tour to Shinagawa Industrial Platform and Tokyo Metropolitan Industrial Technology Research Institute, and gathering assembly to meet entrepreneurs of manufacturers in Shinagawa Ward. (Refer to Appendix 13.)

2-2）Cooperation with Mongolia Chamber of Commerce and Industry

It is notable that Institute of Technology, Mongolian University of Science and Technology has an agreement with Mongolia Chamber of Commerce and Industry and the chamber was invited to the business seminar which was supposed to be held in November 2016. Although the seminar was cancelled, Kosen colleges and the Mongolia Chamber of Commerce and Industry are forging good relationship so far and the Chamber will be also invited to the next seminar.

4.3 Issues on Existing Kosen Technical Colleges in Mongolia

In this section, current situation and issues of existing Kosen Technical Colleges in Mongolia will be discussed and future tasks for the development and stable implementation of Kosen Technical College in Mongolia will be extracted.

4.3.1 Policy Issues Related with Legislation

As mentioned in the Section 3.3.3, considering the situation that the students had already enrolled in the Kosen Technical Colleges, following two points among all tasks should be concerned and developed urgently.

- The degree to be acquired when graduating technical college should be determined and confirmed.
- Legal environments and guarantees that graduates of Kosen Technical Colleges can be transferred to the 3rd year of university should be immediately developed.

These urgent two tasks as mentioned above must be resolved by June 2019 (Model class students of IET Mongol-Kosen will be graduated by June 2018) when the first batch of graduates born from Kosen Technical Colleges.

Furthermore, it is necessary to clarify the position of technical college in Mongolian higher education sector, industrial sector and all Mongolian society to successfully implement and develop the Kosen education system in Mongolia. To do so, short, mid and long term policies should be developed and implemented strategically by MECSS, the main organization body to control the educational sector.

4.3.2 Promoting the Understanding of the Kosen Education

There were only limited people (related persons of MECSS, existing Kosen Technical Colleges, and graduates from Kosen Technical Colleges in Japan) who understand and know the right information of Kosen Technical Colleges in Mongolia when the field survey was carried out during December 2016. And also as a result of aforementioned questionnaire survey on parents showed that the information about Kosen Technical Colleges among junior high schools in Mongolia it wasn't sufficiently or properly spread.

In order to implement Kosen education stably in the future, gaining the understanding and dissemination of the right information about Kosen education and Kosen Technical Colleges through Mongolian people and industrial sector.

- Promotion of Kosen Education system and Activity of Existing Kosen Technical Colleges in Mongolia

There were very few students who knew the 5-year consistent engineering education system of Kosen Technical Colleges. And there were also not many students who are planning to enroll in the universities after completing 3-year course of technical college. In such a situation, active promoting activity should be done to gain the understanding of education features of the technical college through Mongolian society.

- Find out the Internship Accepting Companies and Employing Companies of Graduates

Active promoting activity and public relationship should be done to gain the understanding of education features of the technical college through Mongolian industrial sector to get the acceptance of internship and employment of the Kosen-students. Related persons in charge of existing Kosen Technical Colleges are at the stage of finding out the companies that accepts the Kosen-students to be interned. To realize the internship program, scheduling and internship evaluation methods should be developed after finding out the partner companies.

Moreover, it is shown that Kosen graduates would highly satisfy the human resource needs of Mongolian industrial sector by the analysis results of the demand survey through industrial sector that was indicated in the Chapter 2. Until the period of the first graduates born by June 2019, features of Kosen type engineering education should be introduced sufficiently to find out and get the employment companies for the Kosen graduates.

4.3.3 Towards Level up of Education of Existing Kosen Technical Colleges in Mongolia

To spread Kosen education throughout Mongolia, it seems to be critical to raise up level of education of the existing Kosen Technical Colleges in Mongolia so that they would play role of exemplary models. We would say that especially, the following are problems that have to be settled to pursue the level up.

- Improvement of quality and quantity of the teacher

The reader may understand that number of the teachers of the existing Kosen Technical Colleges is short very much comparing with the data of the number of the teachers of the Sasebo College, stated in 4.1 sections. In the case of four-department formation for Kosen Technical Colleges in Japan, around 20 teaching members are placed for the general education and around ten for each engineering department. Indeed, existing Kosen Technical Colleges in Mongolia have much less number of the students of each subject than Japan, but a little less than ten teaching members are necessary for each specialized department considering the need to prepare enough size of teaching staff who can handles Kosen curriculum and to supervise graduation research.

At the existing Kosen Technical Colleges in Mongolia, graduation research will be compulsory for graduation. The student research is one of important feature of Kosen education and so we would like to point out that the expanding of the number of engineering teaching staff will be a key to level up. Kosen Technical Colleges will need teaching members with doctorates or with experience of research & development work at some enterprises to supervise the students' graduation researches. It may take four to five years until the time comes to be completely ready for specialty engineering education for Year 4 or 5 (securing enough number of highly qualified engineering teaching staff and completion of experimental apparatus). If we take account that at Kosen Technical Colleges in Japan 10 faculty members with doctorates supervise their 40 students, reinforcement for supervision of graduation research will be pivotal in order for existing Kosen Technical Colleges to walk by themselves.

➢ Development of Curriculum and Syllabus

As we have seen in 4.3, the present step is that the existing Kosen Technical Colleges have almost completed the preparation of their curriculum and syllabus modelled after Japanese Kosen. From now on, they would stand in need of modification of the syllabus and curriculum to adjust Mongolian industrial environment or Mongolian educational environment. They may need to frame curriculum with its target producing graduates fitting to Mongolian industrial demands and to compile the syllabus to realize the target, which will be built on the firm basis of general education and basic engineering education of Japanese type.[47]

➢ Improvement of Educational Experimental Equipment and Textbooks

As stated in 4.3.3, New Mongol College is standing at brink of the shortage of experimental apparatus. Moreover, to improve the situation of educational experimental equipment – hardware side, at the same time, it will be needed to develop systematically staff for the maintenance and support for student experiment or laboratory work – software side: note that the existing Kosen Technical Colleges are in the situation that they have not any staff for technical assistance. As mentioned in 4.1.2, in Kosen Technical Colleges in Japan, about three technical officers are assigned to each department playing a significant role of installment of Kosen education.

As to textbooks, except for textbooks for high school curriculum (mathematics, physics, etc.), students are not given textbooks. The current situation is that students are taking notes what their teachers write on black boards or receive the teaching contents (data of slides used at lectures): the teachers prepare the lesson contents referring to Japanese textbooks. The students are missing necessary textbooks, so that they tend to lose the track during classes.

4.3.4 **Problems of each Kosen Technical College**

College of Technology, Institute of Engineering and Technology

・The way to conduct teaching staff training

As to teaching staff training implemented by JICA as a country focused training, College of Technology, Institute of Engineering and Technology may have shown certain developments, but still in the situation that the staff cannot catch up preparatory work of lecturing or experiment/laboratory classes. Some managerial staff point out that it will be more effective to implement long term training session so that Mongolian teaching staff can give lectures in Japan (teaching practice session), or to invite long term visiting professors from Japanese Kosen colleges so that Mongolian teaching staff can be mentees on educational skills.

Institute of Technology, Mongolian University of Science and Technology

・School Buildings

Regarding Institute of Technology, Mongolian University of Science and Technology, the most serious problem is poor condition of its school buildings – wooden buildings which were constructed more than 50 years

[47] We can regard as a precursor the plan of New Mongol College for refurbishing curriculum and syllabus taking opinion of construction industries (section 4.2.3).

ago without air conditioning equipment. It is impossible to refurbish the wooden buildings to support heavy loads of heavy machineries, which means that the buildings are NOT adequate for implementation of Kosen education system and securement of new buildings is urgent matter.

We note that although there was once a plan to make a new building inside the campus of Faculty of Civil Engineering, MUST, and the plan has been in stagnant. Tentatively they use normal classrooms when they conduct experiment/laboratory work. (See Figure 4-11.)

They are facing a serious situation that there are found no spaces for some equipment such as lathes and universal testing machine which are expected to be imported in summer 2017 as donation by non-project grant aid of the Japanese government.

・Entering of Graduates to Year 3 of MUST

The following table (Table 4-17) shows the numbers of credits which are expected to be given to the graduates of Institute of Technology if they enter Year 3 of MUST. The numbers inside round brackets are the credits that the Institute of Technology's Year 4 or 5 students will earn. Since the number of credits to graduate MUST is 130, it is preferable to transfer around 65 credits – half of 130: currently the expectation is not met. Especially, Department of Information Technology will give only 36 credits. Whether the Kosen graduates can earn the rest credits necessary for their graduation of the university will be issue.

Table. 4-17 Numbers of Credits which are Expected to be Given to the Graduates of the Institute of Technology if They Enter Year 3 of MUST

Majors	General Education	Basic Engineering	Engineering	Total Credits
Road Construction	15	34	9（62）	58
Electrical Engineering	15	22	7（57）	44
Mechanical Engineering	15	31	8（58）	54
Industrial Chemistry	15	24	23（60）	62
Information Technology	15	9	12（55）	36

The fewness of the transfer credits seems to be not only due to difference of subjects in Kosen Technical College and in the university but also the university side's little understanding of Kosen education system. To settle the problem, it is necessary to promote understanding of Kosen education system. For example of the measures, we would like to propose a strategy such that the teaching staff should create files including detailed lecture contents (syllabus, lecture notes, handouts to students, question papers, list of students performance and results, students answer papers and so on) and conduct seminars to explain about level of Kosen education and lecture contents to the university based on the files.

New Mongol College of Technology

・Organization Management

Although having drawn up "a blueprint of" its organization structure, New Mongol College has not realized it yet. At present it has no administrative staff and teaching staff are allocated to committees to handle the administrative task – one teaching member belongs to several committees at the same time. For example, equipment management is assumed by one of the committees consisted only by teaching staff[48]. To improve this situation, it would be effective to invite advisors for management from Japan who have experience of working at Kosen Technical Colleges in Japan as administrative staff.

[48] At Kosen Technical Colleges in Japan, technical officers take care of the equipment.

Chapter 5. Framework of the New Mongolian Kosen Education System

5.1 The Importance and Significance of Kosen Education System in Mongolia

Figure 5-1 shows the relationship between the survey results on the needs of industrial human resources and its relation to the education sector.

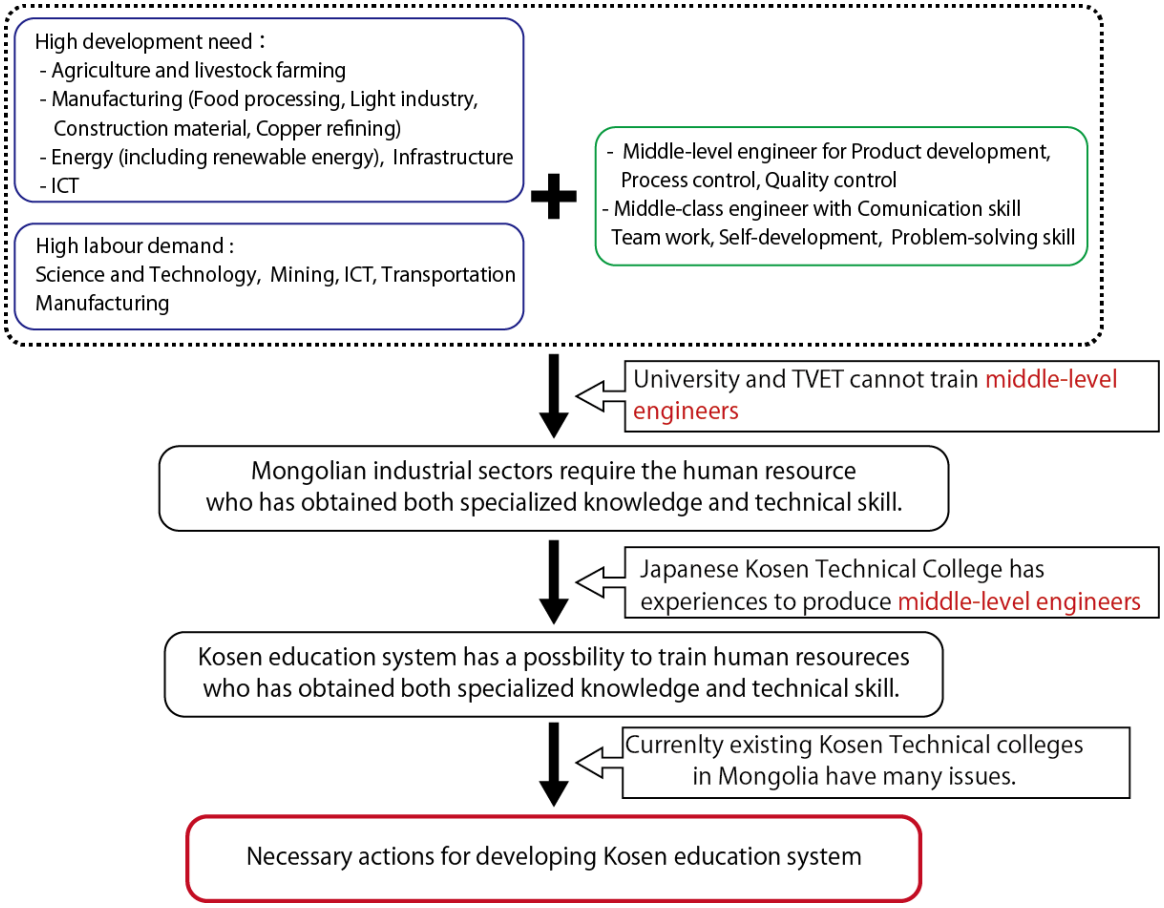


Figure. 5-1 The relationship between the Results of the Industrial Human Resources Survey and the Results of Educational Sectors Survey

Survey on the needs of industrial human resources has showed the industrial sectors with the high development needs and the high projection of labor demand.

Industrial sectors with the high development needs:

- ✓ Agriculture and livestock farming
- ✓ Manufacturing industries (Food processing, Light industry, Construction material, Copper refining)
- ✓ Energy (including renewable energy）,Infrastructure
- ✓ Information and communication Technology

Industrial sectors with the high projection of labor demand:

- ✓ Science and Technology
- ✓ Mining
- ✓ Information and communication Technology
- ✓ Transportation
- ✓ Manufacturing industries

Interview survey of the companies has indicated that the high needs of human resource (functional) shown as follows.

- ✓ Mid-level Engineer with appropriate technical knowledge, who are able to work in product development, process management and quality control
- ✓ Industrial human resource with excellent communication skill, self-improvement skills, problem-solving ability and teamwork skill

Based on the gathered data, it is found that Mongolian industry is in immense need of the industrial human resources who possess both theoretical knowledge and technical skills. Kosen education system consisting of lectures, experiments and vocational training aimed to develop the Mongolian human resources that accommodate the needs from industrial sector. As evidenced in the case of Japan, where Japanese industrial sector prosper due to the highly trained technical human resources, it is thus significant for Mongolia to adopt Kosen education system.

On the other hand, following are the issues that the existing Kosen Technical College currently faced:

- ✓ Underdeveloped legal systems of Kosen education system
- ✓ Inadequate lecturers to implement the new Kosen education system
- ✓ Poor learning environment including insufficient learning materials and equipment

The issues described above are currently faced by the existing Kosen Technical Colleges. The following measures are deemed important in order to develop and improve Kosen educational system in Mongolia:

a) To raise awareness about Kosen education system in Mongolia
b) To set appropriate priority engineering fields that accommodates the needs of industrial human resources
c) To improve the education level of existing Kosen Technical Colleges
d) To formulate the policies and strategies to develop Kosen education system

The most important step among the above-mentioned is to raise awareness about Kosen education system in Mongolia so that the Mongolian become aware of the new Kosen education system. Additionally, as one of the main features of Kosen education system, it is important to establish the collaborative system between

industry and Kosen education system as it is deemed necessary to demonstrate how Kosen education system can foster the industrial human resources that can accommodate industrial sectors' needs.

It is also essential to develop Kosen education system in Mongolia in order to boost the education level of the existing Kosen Technical Colleges. Following are 3 common challenges that can be overcome by the existing Kosen. First, the need to improve both the quality and quantity of lecturers who teach specialized subjects. Second, it is important to improve the equipment and facilities for Kosen education system. Third, it is essential to develop the curriculum that accommodates the needs of industrial sector. In a nutshell, Kosen education system should be operated according to the needs of industrial sectors and higher education system in Mongolia.

5.2 Promoting Awareness of Kosen Education System in Mongolia

It is viewed that the most crucial part when developing Kosen education system in Mongolia is to increase the awareness about the Kosen education system among Mongolian citizens through several promotional activities.

Although some administrative officers in the MECSS and the teachers of existing Kosen Technical Colleges contributed individually in efforts to introducing Kosen education system, it is safe to say that it still remains challenging to sufficiently garner interests from both the Mongolian citizens and the relevant industries. Based on the gathered data from the interview conducted, the participating ministries and companies pointed out that PR activities is the most important step when developing Kosen education system in Mongolia.

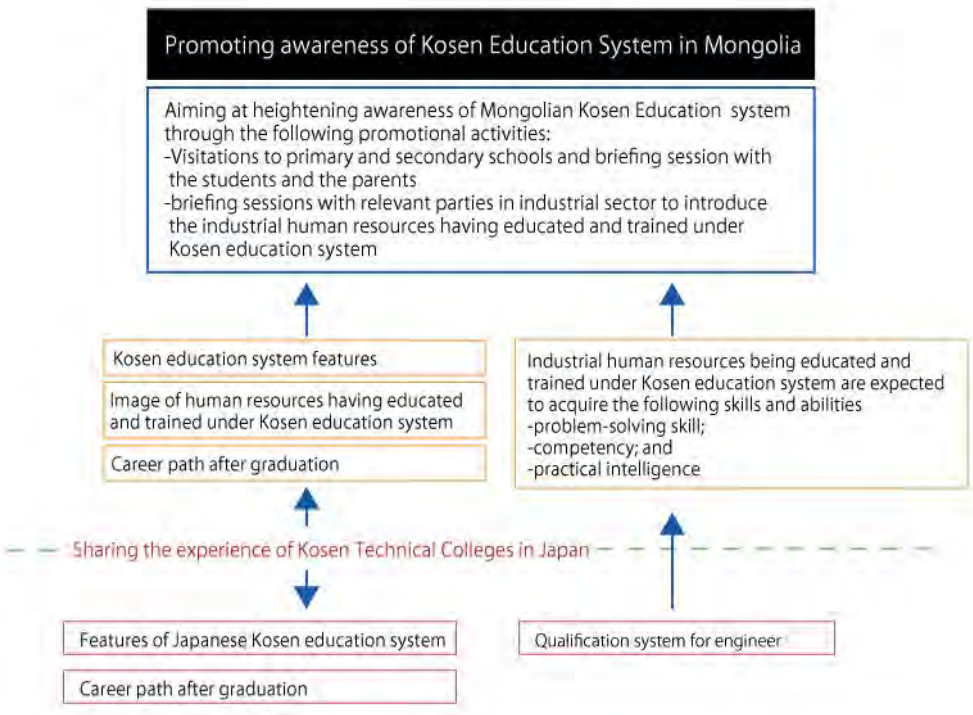


Figure. 5-2 Proposed Support for Promotional Activities of Kosen Education System

As for the PR efforts in the future, it should be considered to organize a cross-sectoral working group which drive forward Kosen education system in Mongolia. The working group should be consisted of Kosen education center, MECSS, MLSP, and NDA. In addition, it is necessary to get support of National Institute of Technology in Japan. Because that Kosen education system is quite newly education system in Mongolia and existing Kosen Technical Colleges have not produced graduates until now. If National Institute of Technology in Japan can be sharing their experiences of PR with Mongolia side, it is promise to obtain a good effect.

Regarding to the PR activities of Kosen education system for the education sector in Mongolia, the MECSS should prepare the seminar and/or workshop for educators in elementary schools, Junior high schools, high schools and Universities. Especially, it is important to explain Kosen education system to the students who graduate from a junior high school and their parents.

In addition, the PR of Kosen education system to the Mongolian industries is another important activity. Because industrial sectors will accept students who graduate from Kosen Technical Colleges. According to the results on the needs of industrial human resources, it is revealed that there is a gap between industrial human resources required by Mongolian industry and human resources cultivated by higher education in Mongolia. Human resources who are cultivated by Kosen education system may match the human resources which Mongolian industrial sectors require. Therefore, it is very important to indicate the images of human resources sought in Kosen education system to Mongolia industries by showing the clear difference among other higher education systems and TVET.

PR activities should be conducted by through a workshop inviting Kosen educators working in primary education, secondary education, higher education organizations and TVET and seminar of human resource cultivated by Kosen education system for the Mongolian Chamber of Commerce and Industry and various industrial association.

The following activities are being considered suitable to promote Kosen education system in Mongolia:

- ✓ To develop the media summarized the information about Kosen in Japan
- ✓ PR activities by getting supports from the active lecturers and the former lecturers at Kosen in Japan.

5.3 Establishing Suitable Priority Engineering Fields that Accommodates the Needs of Industrial Human Resources

One of the features of Kosen education system is its strong linkage with business industries. The history of development of the Kosen education system in Japan reflects the linkage between engineering filed set up in Kosen and the needs of industrial human resources development. Kosen education system has been developed with progress of technologies and industrial promotion policy.

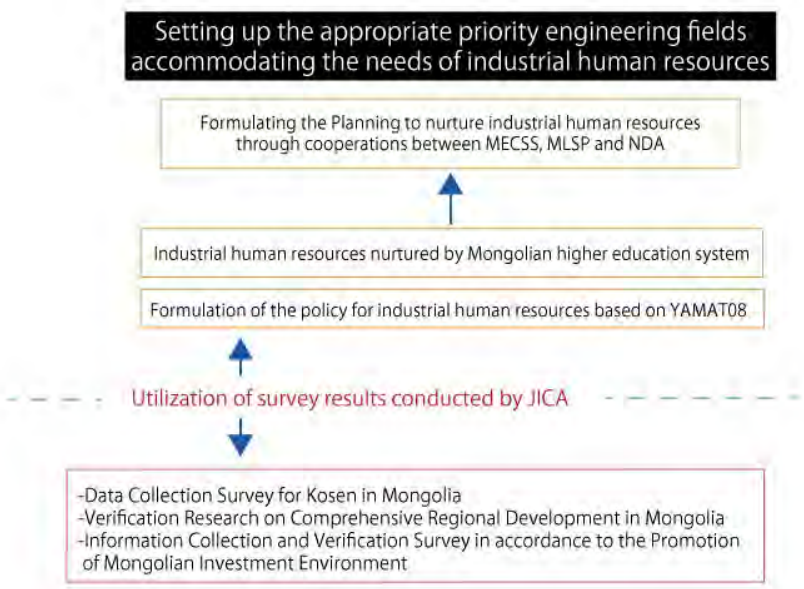


Figure. 5-3 Proposed Support of the Establishment of Industrial Human Resources Plan

It is necessary to establish the framework to develop Kosen education system in Mongolia in conjunction with industrial trends. MLSP and NDA will draw up the plan of industrial human development in future. In addition, MECSS, which manages Kosen education system, will make plan to develop Kosen education system in accordance with the industrial human development plan which MLSP and NDA formulate.

It is necessary that MECSS will establish the legal framework to revamp the departments which set up in Kosen and curriculum with a change of the needs of industrial human resource. Therefore, it is very important to promote academic-industrial collaboration in order to formulate a legal framework to revamp Kosen education system. MECSS should compile information about academic-industrial collaboration activities which conduct in existing Kosen Technical Colleges in Mongolia, and analyze promising industrial sectors and technical skills which industrial sectors require, and reflect on the development of Kosen education system. To formulate the framework mentioned above, the experience which National Institute of Technology in Japan has been developing Kosen education is very helpful to Mongolia.

Additionally, it is essential to educate Kosen-educated human resources as well as to establish the engineering fields that accommodate the needs of industrial human resource. According to the survey result on industrial human resource, it is revealed that Mongolian companies apply for classification of occupation by industry so called YAMAT08. MLSP has recommended to utilize YAMAT08 classification for effective recruitment. Therefore, it is considered that target human resources sought in Kosen education system should correspond to classification of occupation.

MLSP and NDA plan to investigate the needs of industrial human resources. In addition, JICA has conducted various surveys for the industrial development and regional development in Mongolia. JICA survey repots help MLSP and NDA to formulate the plan of industrial human resources in Mongolia.

- ✓ Data Collection Survey for Kosen in Mongolia

- ✓ Verification Research on Comprehensive Regional Development in Mongolia
- ✓ Information Collection and Verification Survey in Accordance to the Promotion of Mongolian Investment Environment
- ✓ Data Collection Survey on Higher Education of Engineering in Mongolia

5.4 Advancement of Education Level of the Existing Kosen Technical Colleges

Currently, there are three Kosen Technical Colleges existing in Mongolia, namely; Institute of Technology of Mongolian University of Science and Technology, Institute of Engineering and Technology (IET), and New Mongol College of Technology have been started in Mongolia. Therefore, it is important to improve the education level of existing Kosen Technical Colleges to develop Kosen education system in Mongolia.

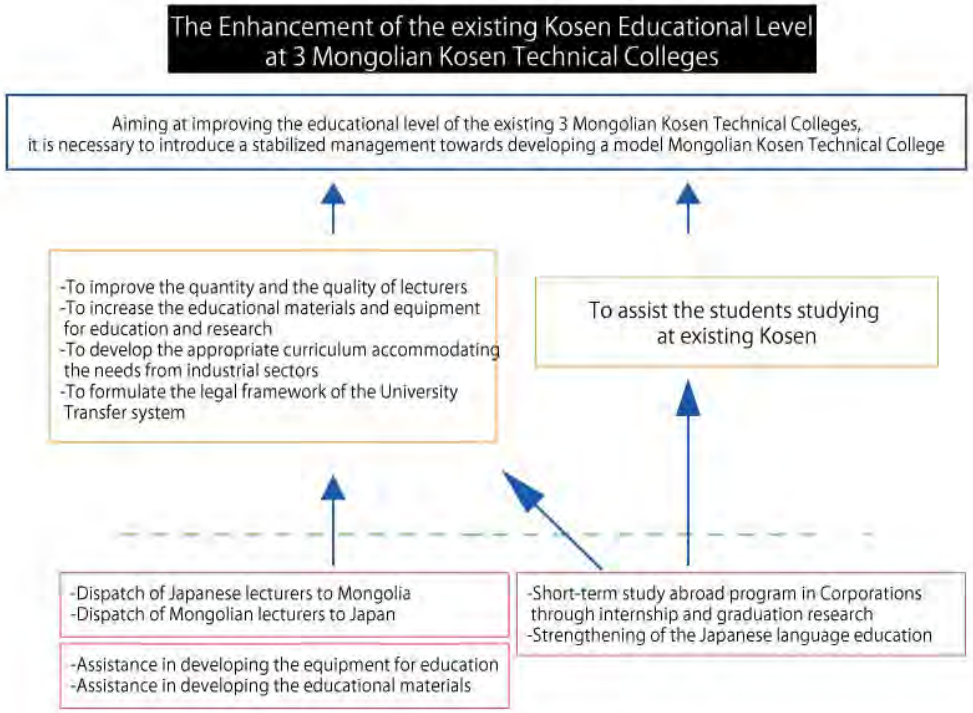


Figure. 5-4 Proposed Support for the Advancement of Education Level of the Existing Kosen Technical Colleges in Mongolia

As previously mentioned in Chapter 4, Figure 5-4 shows the assistance measures against the common issues of existing Kosen Technical Colleges. Considering the improvement of education level in Kosen education system, it is necessary to draft the mid-to-long-term planning and short-term planning in order to develop the Kosen education system in Mongolia. Assistant measure for short-term planning is following item.

- ✓ To assist education for the student studying at existing Kosen Technical Colleges

In present, College of Technology, Institute of Engineering and Technology has 4th year students, Institute of Technology of Mongolian University of Science and Technology and New Mongol College of Technology

have 3rd year students as the highest grade. However, it has not been prepared the enough condition to conduct a graduation thesis, internship program after moving into 4th year and extra lessons such as a robot-contest which is one of the features of Kosen education system. If the students studying at existing Kosen Technical Colleges cannot learn specialized engineering knowledge, technical skill and creative idea sufficiently, the industries which accept the student graduate from Kosen Technical Colleges cannot make proper incorrect assessment of Kosen education system. Therefore, it is necessary to assist education for students studying at existing Kosen Technical Colleges. The following shows assistance measures.

- Assistance in establishing internship program in cooperating companies
- Assistance provided to the participation of the students from the existing Kosen Technical Colleges into the Robot Contest in Japan
- Guidance on graduation research provided by Japanese Kosen Technical Colleges or affiliate universities
- Application of the Fast Track Study Abroad Program under Mongolian Higher Engineering Educational Development Project (M-JEED)

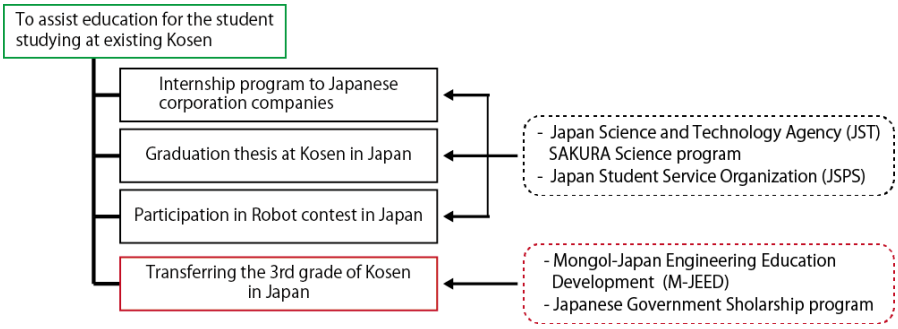


Figure. 5-5 Education Support for Students in the Existing Kosen Technical Colleges

In the Mongolian Higher Engineering Education Development Project where it features the similar program called “Kosen program” where the students can be transferred into Kosens Technical Colleges in Japan through Fast Track Program without having to go through the preliminary screening process[49]. Although it is necessary to discuss the establishment of program under M-JEED program with MECSS, it is deemed appropriate to establish new Fast track program for the student studying in existing Kosen Technical Colleges. However, the purpose of M-JEED project is to provide young students an opportunity to go study abroad in Japan. Even if the new fast track program is approved by MCESS, the number of the students who will be dispatched to Kosen Technical Colleges in Japan by new program seems to be quite limited. Because that M-JEED project provides a priority with the student who study in preliminary program under project. In addition, the assistance measure proposed above, it is necessary for the student to acquire Japanese language skill.

Considering the assistant measures for mid-to-long term, it is necessary to support the common issues of existing Kosen Technical Colleges as follows.

- ✓ To improve quantity and quality of lecturers of specialized subjects

[49]Although the Fast Track program of Kosen progran was conduceted once in the beginning stage of M-JEED, the program has not been conducted after that Currently, restart of Fast Track program has been discussed in working-level consultations

- ✓ To improve educational materials and equipment for education and research
- ✓ To develop the curriculum appropriate to the needs from industrial sectors
- ✓ To formulate the legal framework of University Transfer System

The items mentioned above, these are very important issues to operate Kosen education system by the Government of Mongolia in the future. These challenges should be prepared in middle-term schedule.

- Proposed supporting measures to improve both the quality and quantity of lecturers who teach specialized

In regards to the structure of academic staff in the existing Kosen Technical Colleges who teach general courses, it consists of full-time lecturers and also part-time lectures who are still working in the Universities and other high schools. However, it is hard to measure the quality of the academic staffs who teach specialized subjects. Specialized subject that the students have to learn becomes subdivided subject as students move to higher grade, and it resulted in the number of specialized subject increases. Therefore it is safe to say that they may be an insufficiency in the quantity of the lecturers teaching specialized subjects. Figure 5-1 shows that the academic personnel participation in the individual program (Country focused training) of Implementing Kosen education system in Mongolia, which was conducted by JICA.

Academic personnel who participated in project are improving their teaching skill and providing their knowledge that they obtained through that project with their colleague. After the project, academic personnel who participated in the project become a core academic personnel to develop Kosen education system in Mongolia. However, the number of participation was quite limited, and some of the participants were the lecturer of general courses. After Country focused training in Japan, it is necessary to train the academic personnel of specialized courses in order to develop Kosen education in Mongolia. Because that the lecturer of specialized course might be still insufficient number.

Table 5-1 Number of Mongolian Teachers Participated in the JICA Country Focused Training Program (By Specialized Fields)

	Name	General course				Specialized course				Total	
		English	Mathematics	Physic	Chemistry	Mechanical Eng.	Civil Eng.	Architecture	Electrical Eng.	General course	Specialized course
2015	Institute of Technology, MUST			1	1				1	2	1
	College of Technology, IET				1			1	1	1	2
	New Mongol Institute of Technology	1	1		1					3	0
2016	Institute of Technology, MUST		3							3	0
	College of Technology, IET		1			1	1			1	2
	New Mongol Institute of Technology		1			1		1		1	2
Total		1	6	1	3	2	1	2	2	11	7

Currently, the faculty of bio-engineering as a new major has been established in Institute of Technology, Mongolian Science and Technology, College of Technology, Institute of Engineering and Technology and New Mongol College of Technology. Therefore, it is considered to be necessary to keep up training the academic personnel to increase the academic personnel of specialized courses.

One of the characteristics of Kosen education system requires a graduation thesis. Students who study in Kosen education system acquire the problem-solving skill, competency and practical intelligence through the activities of graduation thesis. To supervise graduation thesis of students, the academic personnel who have experienced to conduct the research and the senior engineer with high specialized knowledge would be required.

In case of Kosen in Japan, the most of academic personnel who provide specialized subjects have doctoral degree. Lecturers who acquire high specialized subject supervise the student to conduct the research thesis in the basis of their own research field. On the other hand, currently there are a few academic personnel which have a doctorate degree in the existing Kosen Technical Colleges. Therefore, it is important to employ the academic personnel with a doctorate degree, who have a lot of experienced in research activities, aiming to operate quality Kosen education system.

In efforts to further developing the human resources of lecturers, it is effective to support the research competences of Mongolian lecturers by supervising of active lecturers and the former lecturers at Kosen Technical Colleges in Japan.

National Institute of Technology in Japan supports to dispatch the active lecturers to existing Kosen Technical Colleges. It is possible to dispatch lecturers from Kosen Technical College in Japan, for instructing lecturers who work in Mongolian existing Kosen Technical Colleges. It is planned to collaborate with faculty members of specialized subjects of Mongolian existing Kosen Technical Colleges by utilizing the expertise of the active lecturers in Kosen Technical College in Japan, including in developing new materials utilizing Mongolian abundant resources as well developing preventive technologies that can reduce deteriorating air pollution problems in Ulaanbaatar. In order to implement this idea, it is important for the Mongolian teachers from the existing Kosen Technical Colleges to draft a research proposal and share the information with the experts from the Japanese Kosen Technical Colleges. It is believed that by gaining cooperation from the Japanese College of Technology, both sides can draft research plan and share the information and they may contribute to the joint research activities between Japan and Mongolia.

- Training in Japan to train teachers to teach specialized subjects of existing Kosen Technical Colleges in Mongolia
- Dispatch of professional of teachers of Japanese Kosen Technical College or former experienced Japanese college teachers
- Overseas dispatch of researchers by support of the National College of Technology for active teachers in Japan

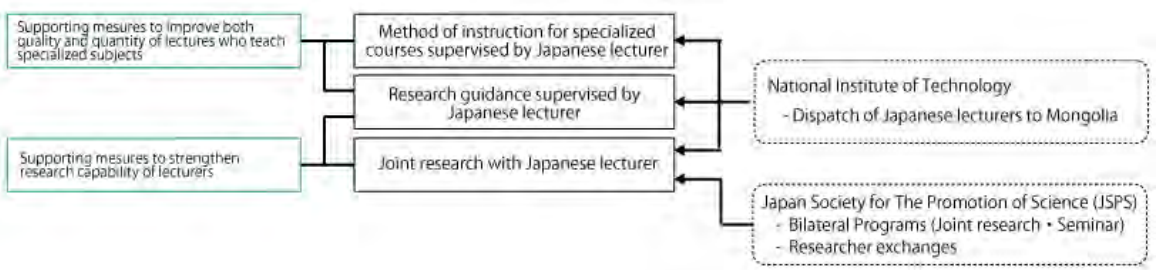


Figure. 5-6 Strengthening the Capacity of Mongolian Teachers

Figure. 5-6 shows the proposed plan for enhancing the quality and quantity of lecturers who will support further Kosen education in Mongolia. It is considered that dispatch of professional of teachers from Kosen Technical Colleges in Japan through National College of Technology is one of the plans.

- Proposed support to improve teaching materials and research equipment

As for the preparation condition of equipment and facilities for education and research in Kosen education, it is difficult to say that the educational environment could be prepared. The preparation status of equipment and facilities in New Mongol College of Technology seems to be serious. IET has prepared the facilities by supporting of private company in Japan and self-help efforts. In addition, IET has University and TVET besides a Kosen. Consequently, IET Kosen can take advantage of the equipment and facilities installed in University and TVET for experimental and practical training in Kosen education. Institute of Technology of Mongolian University of Science and Technology has received educational equipment of 200 million yen by non-project grant aid of Ministry of Foreign Affairs in Japan.

In addition, it is another issues that existing Kosen Technical Colleges have a few technician who maintain the equipment and facilities and supports a practical training. It is important to bring up the technician with specialized knowledge of equipment and facilities in order to operate the equipment for long term. Therefore, it is necessary to support to train Mongolian technicians.

- To support to bring up Mongolian technician for maintenance of equipment and facilities.

Additionally, textbooks shortage impacts negatively on the existing education system in Mongolian Kosen Technical Colleges. As described previously in Chapter 4, the students are not well-equipped with enough textbooks for the specialized courses. On the contrary, there are enough supplies for the general subjects' textbooks due to the availability of similar textbooks for general subjects used in public high schools.

In Kosen Technical Colleges in Japan, academic staffs distribute handouts as a supplementary educational material in class. It is advisable that the Mongolian academic staffs refer to this initiative. This initiative may overcome the problems of textbooks shortage. With that being said, it is therefore crucial to secure sufficient amount of supplementary textbooks that can be used in during lessons.

- Curriculum Development that Meet the Needs of Mongolian Industrial Sector

The specialized fields set up in the existing Kosen Technical Colleges were decided based on the needs of industrial human resources. Currently, the curriculum used in the existing Kosen Technical Colleges has been developed in reference to the curriculum of Kosen Technical College in Japan. The syllabus used in the existing Kosen Technical Colleges is designed by incorporating the public high school's syllabus.

The feature of the curriculum of Kosen education is to develop with the needs of industrial human resource. Kosen should analyze the human resource required by National projects and private companies, and develop the curriculum in accordance with the needs from industrial sector. In addition, curriculum should be developed with the progress of technology.

In order to update the curriculum with maintenance of quality, it requires plenty of experience to update the curriculum. However, there are a few academic personnel who can update the curriculum in existing Kosen Technical Colleges. Consequently, it is necessary to bring up the Mongolian academic personnel who can update the curriculum under supervision of academic personnel who has a lot of experience to update the curriculum.

- To dispatch the senior academic personnel to develop the curriculum of Kosen education

- Introduction of Legal Framework for the University Transfer System

In order to boost the Mongolian Kosen education system, MECSS should introduce a legal framework that enable Kosen graduates to transfer into the 3rd year of university into Higher Education Act where the framework should be drafted according to the existing education system in Mongolia.

In case of Kosen Technical College in Japan, 40% of Kosen graduates transfer into the 3rd year of university. This is also another feature of Kosen education system that have a various career path. In order to develop Kosen education system in Mongolia, it is necessary to consolidate the legal framework including the University Transfer System.

- To dispatch the active academic personnel who are familiar to the introduction of Kosen education (Legal framework) to Mongolia

5.5 Policy and Strategy for Developing Kosen education in Mongolia

In order to strengthen Kosen education system in Mongolia, it is essential to clarify statutorily the position of Kosen education system among industrial sector and educational sector in Mongolia, then to raise awareness of Kosen education system in Mongolian society sufficiently.

A short-term, a middle-term, a long-term planning for developing Kosen education in Mongolia must be strategically planned by MECSS. A base point should be placed at the time when existing Kosen Technical Colleges will provide the first batch of graduates.

Short-term planning must be designed in advance before the first batch students graduating from existing Kosen Technical Colleges in Mongolia. Meanwhile, mid-term planning is aimed at establishing a stable system of Kosen education in Mongolia. As for long-term planning, it is deemed appropriate to develop Kosen education in cooperation with industrial sectors.

- Short-term planning （Until June in 2019）

Short-term planning must be designed in advance before the first batch students graduating from existing Kosen Technical Colleges in Mongolia. The 1st Batch of students who are currently enrolling in the existing Kosen Technical Colleges is expected to graduate in June 2019. Therefore, MECSS must formulate a legal framework as follows; one is a type of academic degree for the student who graduate from Kosen Technical College, and the other is to formulate University Transferring system for the graduates of Kosen Technical Colleges.

In addition, it is necessary to consolidate the educational environment of existing Kosen Technical Colleges. In order to improve the educational environment, MECSS must plan staff cost of new academic staff and new technical staff.

- Mid-term planning（Until June in 2024）

Mid-term planning is the action plan for about 5 years after the first batch students will graduate from existing Kosen Technical Colleges. This term should be a period to update the Kosen education system. Because that existing Kosen Technical Colleges will get evaluations of graduates from the companies and industry sectors. MECSS should examine the skills possessed by Kosen-graduated human resources and analyze the evaluations of Kosen graduates from industrial sectors. In a nutshell, curriculum of Kosen education should be updated in accordance with the evaluation result of Kosen graduates from industrial sectors.

- Long-term planning（from June in 2024）

In a long-term perspective, it is essential to formulate a feasible plan aimed at developing Mongolian Kosen education system based on the Japanese Kosen education system that has been developed throughout these past years. Our survey shows that it would be the crucial part to build up, modeled after National Institute of Technology, Japan, a system or a mechanism which administers Kosen educational-managerial matters in Mongolia: management of equipment, budget, human resource, organization management and so on. And it would be fundamental to lay out a strategy to establish Kosen technical colleges in provinces outside Ulaanbaatar to expand Kosen education, which will play a central role in the improvement of local students' accessibility to higher education as well as new industrial creation.

In sum, this report aimed to contribute to the further development of the Kosen education system in Mongolia.

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Appendix 1 Schedule of First Survey in Mongolia (December, 2016)

Date		Time	Activity	Remarks
2016/12/5	Mon	10:00-11:00	visit Institute of Technology, Mongolian University of Science and Technology	
2016/12/6	Tue	9:00	Internal meeting	
		10:00-13:00	Meeting with Ministry of Education, Culture, Science and Sports	Introducation of ICR and explanation of survey policy
		15:40-16:30	Pay a courtesy call to Ministry of Education, Culture, Science and Sports	
		17:00-18:40	Khan Institute of Technology	Introducation of ICR and explanation of survey policy
2016/12/7	Wnd	8:50-10:10	Meeting with New mongol college of Technology	Introducation of ICR and explanation of survey policy
		10:50-12:50	Meeting with College of Engineering, Institute of Engineering and Technology	Introducation of ICR and explanation of survey policy
		13:30-15:00 17:30	Meeting with National Development Agency	Introducation of ICR and explanation of survey policy
		15:20-17:00	Meeting with Institute of Technology, Mongolian University of Science and Technology	Introducation of ICR and explanation of survey policy
2016/12/8	Thu	9:30-10:50	Meeting with Mongolian-Japan Center for Human Resource Development	Introducation of ICR and explanation of survey policy
		11:45-14:50	Visit German-Mongolian Institute for Resource and Technology (GMIT)	
		17:00-18:00	Meeting with JICA	Introducation of ICR and explanation of survey policy
		19:30	Meeting with JICA expert of Airport	
2106/12/9	Fri		Internal meeting	

Date	Monday	Tuesday	Wendesday	Thusday	Friday
	2016/12/12	2016/12/13	2016/12/14	2016/12/15	2016/12/16
AM	10:30-12:30 National Elderly Care Development Center	9:45-11:00 MS Terezza @Yaarmag 10:00-11:00 Ministry of Education, Culture, Science and Sports 10:00-13:00 Institute of Technology 11:30-12:45 NGO Batgereld Ireedui	9:30-10:30 Mongolia-Japan Center for Human Resources Development	9:00-11:00 New Mongol College of Technology 9:30-10:30 Mongolia-Japan Center for Human Resources Development	National Development Agency 9:30- Mongolian National Association of College of Technology 10:00-12:00 Institute of Technology, Mongolian University of Science and Technology
PM	15:00-16:30 "Missionaries of Charity Mongolia" Bayankhoshuu center	14:45-16:30 Tugeemel Khugjil	13:30-15:00 Mongolian University of Science and Technology	17:00- Ministry of Education, Culture, Science and Sports	13:00- Ulaanbaatar liaison Office, National Institute of Technology 14:30- Asian Development Bank 16:30- UB Development Corporation
Date	2016/12/19	2016/12/20	2016/12/21	2016/12/22	2016/12/23
AM	11:00- Ministry of Education, Culture, Science and Sports	9:30- Mongolian National Chamber of Commerce and Industry 10:00- Ministry of Food, Agriculture and Light Industry	10:00-11:30 Ministry of Mining and Heavy Industries Company visit	Company visit	Company visit
PM	14:00- College of Engineering, Institute of Engineering and Technology 15:00- Ministry of Labor and Social Protection 17:00- Sumitomo Ulaanbaatar Office	14:00- Ministry of Road and Transport Development 15:30- Ministry of Labor and Social Protection 17:00- ITOCHU Ulaanbaatar office	14:30- Architectural Development Center Company visit Company visit	Company visit Company visit	Company visit Company visit
Date	2016/12/26	2016/12/27	2016/12/28		
AM	9:00- Aizawa Mongol LLC 11:00- Toyota Motors Mongol office	Farm Do New Com			
PM	Sanko Mongolia	Ulaanbaatar city			

Appendix 2 Schedule of First Survey in Mongolia (January, 2017)

Date	Monday	Tuesday	Wednesday	Thursday	Friday
	2017/1/9	2017/1/10	2017/1/11	2017/1/12	2017/1/13
AM		10:30-11:30 Himon Construction LLC 12:30- Association for software (MOSA)	11:00- Gazarchin University 13:00- Nakhia Impex LLC	10:30- Mon Shibasaki LLC	9:30- Institute of Technology, Mongolian University of Science and Technology 10:30- GOBI LLC 12:00- National Council for Education
PM		15:00- Nakhia Impex LLC	15:00- College of Technology, Institute of Engineering and Technology 15:30- Gobi Khangai LLC 17:00- National Mechanical University	14:00- Khugjil Trade	14:00- Khukh Tug Trade LLC
Date	2017/1/16	2017/1/17	2017/1/18	2017/1/19	2017/1/20
AM	10:00-12:00 Shine Uy-TVET	10:30－12:00 Bioconbinat LLC	10:30-11:30 World wide logistics LLC Forwarder		10:00-11:00 Institute of Technology, Mongolian University of Science and Technology
PM	14:30-16:00 Mobiservice TVET	14:00-15:00 Mongolian University of Science and Technology 15:00－16:30 Oulen Mench LLC	14:30－16:00 Ashid Nehmel LLC		
Date	2017/1/23	2017/1/24	2017/1/25	2017/1/26	2017/1/27
AM		10:30－12:30 Mongolian Railway & Transportation College	10:30-12:00 Mobicom	10:00-12:00 IT-ZONE	10:00－12:00 Darkhan TVET
PM	14:30-16:30 Oyu Tolgoi	14:00-16:00 Transwest Mongolia	14:00-16:00 Suu LLC	16:00－17:30 Darkhan Iron foundry	
Date	2017/1/30	2017/1/31			
AM	(10:30-12:30) Thermal power station	(Moving day from Ulaanbaatar to Japan)			
PM	JICA				

Appendix 3 Schedule of Second Survey in Mongolia (March, 2017)

Date		Time	Activity	Remarks
2017/3/6	Mon	10:00-11:30	Meeting with principals of Institute of Technology, Mongolian University of Science and Technology and New mongol college of Technology	Explanation of DF/R and survey result
2017/3/7	Tue	9:00-11:50	Meeting at Ministry of Education, Culture, Science and Sport	Explanation of DF/R and survey result
		14:00-16:30	National Development Agency, Ministry of Food, Agriculture and Light Industry	Explanation of DF/R and survey result
2017/3/8	Wend	11:00-15:00	Internal meeting	
2017/3/9	Thu	9:30-11:45	Ministry of Labor and Social Protection, Mongolian Institute of Educational Research	Explanation of DF/R and survey result
		14:00	Ministry of Mining and Heavy Industries, Ministry of Road and Transport Development	Explanation of DF/R and survey result
2017/3/10	Fri	9:30-12:15	Seminar for company	Explanation of DF/R and survey result
		14:00-15:15	Ministry of Education, Culture, Science and Sports	Explanation of DF/R and survey result
		16:00-16:45	JICA	Explanation of DF/R and survey result
		18:00-19:00	Meeting with existing Kosen Technical college	

Appendix 4 Interview Questions to investigate the Industrial Needs

	Contents		Answer	Remarks
1	Company attribution			
	1)	Company name		
	2)	Year of foundation		
	3)	Company size		
		① Capital stock		
		② Sales		
		③ Employees		
	4)	Capital composition (Main stockholders and holding rate)		
	5)	Composition of organization		
	6)	Business type ( )	a. Mining; b. Agriculture and meadow; c. Food processing; d. Textile; e. Leather; f. Construction; g. Construction materials; h. Energy; i. Care Welfare; j. Medical; k. ICT l. Other construction business; m. Other service	
	7)	Main product/ service		
	8)	Main business partner (purchase from, sales for)		
	9)	Rate and Country of Import-Export	Export: (%, Country:) Import: (%, Country:)	
	10)	Stream of business and industry		
2	Job definition by job type, required skills			Graduate from (University, TVET, etc.), number
	1)	Consultant engineer		
	2)	Professional engineer		
	3)	Engineer		
	4)	Technician		
	5)	Worker		
	6)	Others		

3	Number of human resource, evaluation, characteristics (advantage, disadvantage) by graduating higher educational institute		
	1）	Graduate school (Master, Ph.D.) Number:	
	2）	Undergraduate Number:	
	3）	(Technical)College Number:	
	5）	TVET Number:	
	6）	Senior High School Number:	
4	Specific contents of human resource development		
	1）	OJT	
	2）	Training	
	3）	Others	
5	Current and future manpower needs (how many people/what level of human resources will be requires)		
	1）	Present (within a year)	
	2）	Future (after 1-3 years)	
6	Any comments towards contents and condition of higher education in Mongolia (in relation to correspondence to industrial need especially)		
7	Others		

Appendix 5 Request for Mongolian National Association of Supporters of College of Technology for development of Kosen Education System in Mongolia

МОНГОЛ УЛСЫН БОЛОВСРОЛ,
ШИНЖЛЭХ УХААНЫ САЙД
14200 Улаанбаатар хот, Сүхбаатар дүүрэг,
Бага тойруу 44, Засгийн газрын III байр,
Утас: 26-24-80, Факс: 32-31-58, 26-06-13
E-mail: info@mecs.gov.mn, http:www.meds.gov.mn

2014.07.08 № 1/4151
танай 2014.07.08-ны № 01УКЕ01 -т

МОНГОЛ КООСЭН БОЛОВСРОЛЫН
ТӨВ ТӨРИЙН БУС БАЙГУУЛЛАГЫН
ТЭРГҮҮН А.ГАНБАЯР ТАНАА

Танай хүсэлтийн хариу

Япон Улсын дээд боловсролын Коосэн тогтолцоог нэвтрүүлэх, сургалтын агуулга, стандартыг боловсруулж, мөрдүүлэх талаар хамтран ажиллахаар тавьсан танай хүсэлтийг манай яамны зүгээс бүрэн дэмжиж байгаагаа илэрхийлж байна.

Мөн гадаадтай хамтарсан "Судалгааны гүүр" төсөл хэрэгжүүлэх замаар манай судлаачдын ур чадварыг дээшлүүлэх танай санал, санаачлагыг дэмжиж, энэ талаар гадаадын байгууллагуудад хүсэлт гаргах, төслийн хөрөнгийг босгох талаар менежментийг хийхийг дэмжиж ажиллах болно.

Л.ГАНТӨМӨР

09 01944

Appendix 6 Ministerial Ordinance for establishment of Kosen Education Working Group to Develop Educational Law for Kosen Education

БОЛОВСРОЛ, СОЁЛ, ШИНЖ ЗОХ УХААНЫ ЯАМНЫ
ТӨРИЙН НАРИЙН БИЧГИЙН ДАРГЫН
ТУШААЛ

2015 оны 08 сарын 10 өдөр Дугаар А/317

Ажлын хэсгийн бүрэлдэхүүн батлах
ажил эрчимжүүлэх тухай

Монгол Улсын Засгийн газрын тухай хуулийн 24 дүгээр зүйлийн 24.2 дахь хэсэг, Дээд боловсролын тухай хуулийн 10 дугаар зүйлийн 10.2.1 дэх заалт, Японы Үндэсний технологийн хүрээлэнтэй байгуулсан санамж бичгийн 1 дүгээр зүйлийг тус тус үндэслэн ТУШААХ нь:

1. Шаталсан сургалтаар үйлдвэрийн инженер, технологчдыг бэлтгэх технологийн дээд боловсролын сургалтын байгууллага (КООСЭН)-ын үйл ажиллагаанд бодлого, төлөвлөлт, хэрэгжилтийн дэмжлэг үзүүлэх, сургалтын орчин нөхцөлийг сайжруулах, багш, ажилтныг сургах, ур чадварыг нэмэгдүүлэх, шинэчилсэн сургалтын хөтөлбөр төлөвлөгөө боловсруулах үйл ажиллагааг удирдлагаар ханган үүнд дааг зохицуулах үүрэг бүхий ажлын хэсгийн бүрэлдэхүүнийг хавсралт ёсоор батлагдсугай.

2. Шинжлэх ухаан, технологийн их сургуулийн Технологийн дээд сургуулийн хөгжлийн бодлогыг тодорхойлж, үйл ажиллагааг жигдрүүлэх, багш, суралцагчдын ажиллах, суралцах орчинг сайжруулж, шаардлагатай техник, тоног төхөөрөмжөөр хангах, холбогдох арга хэмжээ авч ажиллахыг Шинжлэх ухаан, технологийн их сургууль /Б.Очирбат/-д үүрэг болгосугай.

3. Шинжлэх ухаан, технологийн их сургуулийн Технологийн дээд сургуулийн сургалтын үйл ажиллагаанд шаардлагатай хөрөнгө оруулалт, урсгал зардлын хөрөнгийг 2016 оны төсөвт тусгах арга хэмжээ авахыг Санхүү, эдийн засгийн газар /Ц.Баярхүү/-т даалгасугай.

4. Боловсрол, соёл, шинжлэх ухааны сайдын 2012 оны "Ерөнхий боловсролын сургуулийн лаборатори сургууль байгуулах тухай" А/387 дугаар тушаалын хавсралтад "42. Улаанбаатар. Шинжлэх ухаан, технологийн их сургуулийн ахлах сургууль)" гэж нэмсүгэй.

5. Энэхүү тушаалын гүйцэтгэлийг хангах, үйл ажиллагааны нарийвчилсан төлөвлөгөө батлуулан тодорхой үе шаттайгаар ур дүнг мэдээлж,

9 1155

Appendix 7 Ministerial Ordinance for establishment of Kosen Education Working Group to Develop Educational Law for Kosen Education (Japanese)

高専教育システム導入について

ノテンバヤルモンゴル教育文化科学省戦略局長が日本の高専機構、東京高専、
仙台高専を訪問し、モンゴルで高専システムの導入を促進するため、教育文化科学省で
実行委員会を組成することになりました。
そしてモンゴル教育文化科学大臣の 2015 年 8 月 10 日の第 A/317 号で委員会が下
記の構成で組成されました。

委員長：
1. ナサンバヤルモンゴル教育文化科学省戦略局長
メンバー：
2. ルンベヘーモンゴル教育文化科学省戦略品専門員
3. ハンフオリギルモンゴル教育文化科学省対政経済局専門員
4. ツァガラルモンゴル教育文化科学省高等教育局専門員
5. ガンバヤル国立科学技術大学工科大学校長、
NGO モンゴル高専教育センター理事長
6. セルグレン 工業技術大学会長、
NGO モンゴル高専教育センター理事
7. ブヤンジャルガル 新モンゴル高専校長、
NGO モンゴル高専教育センター理事

委員会は下記の事業を促進し、管理する義務を持ちます。

1. モンゴルの高専の法的環境整備
2. 広報活動、高専を一般市民に広くもらする活動
3. 教育者の対する教育セミナー開催
4. モンゴルにおける高専のカリキュラム、シラバス作成
5. 高専の教科書の翻訳作業を支援する
6. モンゴルの高専設置基準作成を支援
7. 高専の国際交流を支援する

NGO モンゴル高専教育センター理事長 ガンバヤル

Appendix 8 Proposal of Standards of Kosen Technical College

ТАНИЛЦУУЛГА

Дээд боловсролын тухай хуульд нэмэлт, өөрчлөлт
оруулах тухай хуулийн төслийн тухай

Монгол Улсын аж үйлдвэр болон боловсролын салбарын хөгжилд өндөр түвшний дээд мэргэжлийн инженер бэлтгэж, нийгмийн хэрэгцээ, зах зээлийн шаардлагыг хангах, гадаадын ажиллах хүчний орон зайг үндэсний өндөр түвшний инженерээр нөхөх, инженерийн боловсролын нэр хүндийг өсгөх зорилго бүхий эрхзүйн шинэчлэлийг гүнзгийрүүлэх шаардлагатай байгаа билээ. Япон Улсын Коосэн хэмээх инженерийн дээд боловсролын тогтолцоог нэвтрүүлэхэд эрхзүйн зохицуулалтын шинээр хийж өгөх зорилгоор зохих нэмэлтийг хуулийн төсөлд оруулсан.

Засгийн газрын 2012-2016 оны үйл ажиллагааны хөтөлбөр, боловсролын салбарт төрөөс баримтлах бодлогод нийцүүлэн Дээд боловсролын тухай хуульд нэмэлт, өөрчлөлт оруулах тухай хуулийн төслийг боловсрууллаа.

Хэдийгээр манай улсад инженер техникийн дээд боловсролтой мэргэжилтэн бэлтгэж байгаа боловч, сургалтын агуулга болон зах зээлийн хэрэгцээ шаардлагад нийцэхгүй байх тохиолдлууд их байна. Дээд боловсрол эзэмшсэн боловч, төгсөж гараад аж ахуйн нэгжүүдийн шаардлага хангахгүй байна. Бүтээлч сэтгэхүй дутмаг, инженерийн наад захын шийдэл гаргах, зохион бүтээх тал дээр манай улсын их дээд сургууль төгсөгчид хангалттгүй байна.

Орчин үеийн Японы Улсын эдийн засгийн хөгжлийг Япог Улсын Коосэн сургалтын тогтолцоогүйгээр төсөөлөхийн аргагүй билээ. Тэдний эдийн засгийн хүчирхэг байдал, аж үйлдвэржсэн түүх нь Коосэн сургалтын тогтолцоотой салшгүй холбоотой байна. Монгол Улс импортыг орлох, экспортыг дэмжих, аж үйлдвэрийн салбарт ажиллах бүтээлч сэтгэхүйтэй инженер бэлдэх зах зээлийн эрэлт шаардлага байгаагийн зэрэгцээ энэхүү салбарыг эрхзүйн хувьд дэмжих, одоо үйл ажиллагаа явуулж байгаа сургуулиудыг эрхзүйн хувьд тогтвортой сургалт явуулах нөхцлөөр хангах зохицуулалт үгүйлэгдэж байна.

Одоогоос 50 жилийн өмнө Япон Улс Коосэн сургалтыг бий болгож, түүнийхээ ачаар орчин үеийн Япон орны аж үйлдвэрийг үе шаттайгаар бий болгож иржээ.

Дээд боловсролын тухай хуульд нэмэлт өөрчлөлт оруулах тухай хуулийн төсөл нь 7 зүйлтэй байх бөгөөд 1 дүгээр зүйлд Коосэн сургуулийг төгсөгч нь дүйцсэн бакалаврын шашлалтай байх, 2 дугаар зүйлд Нарийн мэргэжлийн технологийн дээд сургууль байх, 3 дугаар зүйлд 5 жилийн сургалттай технологийн дээд сургуульд дунд боловсролтой иргэнийг элсүүлэх, 4 дүгээр зүйлд дүйцсэн бакалаврын сургалт 110 аас доошгүй багц цаг байхаар, 5 дугаар зүйлд мэргэшсэн инженер хүн хичээл зааж болох тухай, мөн тэдгээр хүмүүст профессор цол олгох, 6 дугаар зүйлд сургалт нь дүйцсэн бакалаврын шатлалтай байхаар, 7 дугаар зүйлд дүйцсэн бакалаврын төгсөгч, кредит тооцож их дээд сургуульд

шилжин орж суралцаж бакалаврын зэрэг авч болохоор эрх, үүргийг тодорхой болгоход чиглэгдсэн зохицуулалтыг тусгав.

Энэхүү хууль батлагдсанаар Засгийн газрын үйл ажиллагааны хөтөлбөр, төрөөс боловсролын салбарт баримтлах бодлогын баримт бичигт тусгагдсан олон талт сургалтын зорилтууд хэрэгжих эрх зүйн үндэс бүрдэж, улмаар улс орны нийгэм эдийн засагт доорх эерэг үр дүн гарна гэж үзэж байна.

Хуулийн төслүүд, холбогдох материалыг хавсаргав.

ЗАСГИЙН ГАЗАР

БАТЛАВ

БОЛОВСРОЛ СОЁЛ, ХУУЛЬ ЗҮЙН САЙД

ШИНЖЛЭХ УХААНЫ САЙД

Л.ГАНТӨМӨР

Ч.ДОРЛИГЖАВ

ДЭЭД БОЛОВСРОЛЫН ТУХАЙ ХУУЛЬД НЭМЭЛТ, ӨӨРЧЛӨЛТ ОРУУЛАХ ТУХАЙ ХУУЛИЙН ТӨСЛИЙН ҮЗЭЛ БАРИМТЛАЛ

Нэг.Хуулийн төсөл боловсруулах үндэслэл, шаардлага

Төрөөс боловсролын талаар баримтлах баримт бичгийн II-1-7-д "...боловсрол эзэмших арга, хэлбэрийг олон хувилбартай, чөлөөтэй, нээлттэй болгох", боловсролын талаар төрөөс баримтлах бодлогыг хэрэгжүүлэхдээ II-2-1-д "Монгол орны эдийн засаг, нийгэм, шинжлэх ухаан, технологийн хөгжил, хүн ам зүй, хөдөлмөр эрхлэлт, нийгмийн баталгаа, нутаг дэвсгэрийн бодлого" зэргийг харгалзан үзэхийг заасан байдаг.

Монгол улсын эдийн засгийг хөгжүүлэх, бүтээн байгуулалтыг тогтвортой хэрэгжүүлэхэд одоогийн байдлаар 38000 инженер, техникийн ажилчид нэн тэргүүнд шаардлагатай байна.

Дээд боловсролын тухай хуульд нэмэлт, өөрчлөлт оруулах тухай хуулийг баталснаар инженерийн дээд боловсрол эзэмших арга хэлбэрийг олон арга, хэлбэртэй болгож, инженерийн мэргэжлийн сургуулийг бий болгож, одоо хэрэглэж байгаа ахлан сургуулийн шатлалыг их сургуулийн 2 болон 3 жилийн шатлалтай нэгтгэн 5 жил дээд түвшний инженерийн боловсрол эзэмших бололцоог хангах юм. Өөрөөр хэлбэл дунд сургуулиа төгссөн 15 настай 9 дүгээр ангийн сурагч, инженерийн дээд түвшний сургуульд элсэн суралцаж 20 настайдаа дүйцсэн бакалавр зэргээр төгсөх боломжтой болох юм.

Монгол Улсад дээд боловсрол олгох үйл ажиллагааг .... онд батлагдсан Дээд боловсролын тухай хуулиар зохицуулж байгаа бөгөөд хууль хэрэгжсэн .... жилийн хугацаанд зарим асуудлаар, тухайлбал Япон Улсад хэрэгжээд прагтик дээр батлагдсан инженерийн дээд түвшний "Коосэн" хэмээх боловсролын тогтолцоог Монгол Улсад зохицуулан хэрэгжүүлэх хэрэгцээ, шаардлага байгаа тул, дээд боловсролын тухай хуулийн зарим заалтуудад зайлшгүй нэмэлт өөрчлөлт оруулах шаардлагатай байна.

Монгол Улсад инженерийн дээд боловсролыг олгохдоо бүрэн дунд боловсрол олсон суралцагчийг дээд сургуульд элсүүлэн 4 жил сурган бэлтгэдэг.

4 жилийн сургалттай их сургуульд элсэн орох явдлыг хөнгөвчлөх, сургууль завсардагсдын тоог нэмэгдүүлэхгүй байх арга хэмжээний хүрээнд Коосэн тогтолцоог иж бүрэн мэргэжлийн боловсрол олгох сургалтын байгууллага болгохын зэрэгцээ их дээд сургууль болон ахлах сургуулийн анги шатлалыг нэгтгэсэн 5 жилийн сургалттай шинэ тогтолцоог бий болгох тухай хуулийн төсөл боловсруулав.

Мэргэжлийн дээд сургуулийн зорилго нь "Мэргэжлийн ур чадвар олгох өндөр түвшний сургалт, судалгааг явуулж шаардлагатай нөхцөлдахлах сургуулийн боловсролыг олгох ба ажил мэргэжил болоод ахуй амьдралд хэрэгцээтэй чадвар дадлыг олгох явдал" гээд 4 жилийн сургалттай их сургуулиас тусдаа өөр зорилго бүхий дээд боловсролын байгууллага байна гэж үзсэн.

Коосэн сургууль нь аж үйлдвэрлэлийн салбарт голлох инженерүүдийг бэлтгэнэ гэсэн зорилгодоо хүрэх тогтолцоог бий болгосон бөгөөд их сургуулиас тусдаа дээд боловсролын байгууллага юм гэдгээ тодорхой зааж өгсөн.

Коосэн сургуулийн зорилгыг “суралцагчдад мэргэжлийн ур чадвар олгох өндөр түвшний сургалтыг явуулна” гэж тодорхойлдог бөгөөд “судалгаа”-г тус сургуулийн үндсэн зорилго биш юм гэж үзсэн нь их сургуулиас ялгарах онцлогийг нь тов тодорхой болгож өгөхийн зэрэгцээ мэргэжлийн боловсрол олгох сургалтын байгууллага юм.

Коосэн сургуулийн зорилго нь “суралцагчдад мэргэжлийн ур чадвар олгох өндөр түвшний сургалт”-ыг явуулж, “тухайн мэргэжилд шаардлагатай чадвар дадлыг эзэмшүүлэх” явдал юм. “Ур чадвар” гэдэг нь эрдэм мэдлэг болоод ур дүй гэсэн утгаар ерөнхийдөө хэрэглэгддэг бөгөөд их дээд сургуульд ч мөн хэрэглэгддэг үг юм. Харин Коосэн сургуулийн агуулгаар тайлбарлах юм бол ур чадварын онол ба туршилт дадлагыг голлосон практик чадвар гэсэн утгаар хэрэглэгднэ. Коосэн сургуулийн зорилгыг “суралцагчдад мэргэжлийн ур чадвар олгох өндөр түвшний сургалтыг явуулах” гэж үзэж болно.

Технологийн хувьсгал явагдаж буй өнөө цагт шилдэг инженерүүдийг бэлтгэн гаргах Коосэн сургуулийн хувьд сургалтын агуулгыг эрдэм шинжилгээний хөгжилд нийцүүлэхийн тулд шаардлагатай судалгаа шинжилгээг хийх нь тохиромжтой. Энэ үүднээс барилга байгууламж, тоног төхөөрөмжөөр хангах, судалгааны зардлыг гаргах зэрэг тохирох арга хэмжээг авах нь манай улсын хөгжилд тустай юм.

Коосэн тогтолцоо нь 4 жилийн тогтолцоотой их сургуулиас тусдаа өөр зорилго, шинж чанарыг агуулсан дээд боловсролын байгууллага учир мэргэжлийн иж бүрэн цогц боловсролыг олгохын тулд ахлах сургуулийн сүүлийн 3 жилийг багтаасан 5-6 жилийн сургалттай байна.

Иймд Монгол Улсын аж үйлдвэрлэлийн салбарт дээд сургууль төгсөгчидтэй дүйцэхүйц технологийн мэргэжилтэн нэн шаардлагатай байгаатай уялдуулан Коосэнгийн зорилго шинж чанарыг тодорхойлж, тогтолцоо, агуулгыг төгөлдөржүүлэх, ахлах сургуулийн сүүлийн 3 жилийг их дээд сургуулийн 2 жилтэй нэгтгэсэн 5 жилийн сургалттай технологийн мэргэжлийн боловсрол олгох Коосэн сургуулийг нэн яаралтай байгуулах шаардлагатай байна.

Дээд түвшний технологийн инженер бэлтгэх зорилготой мэргэжлийн боловсрол олгох сургалтын байгууллагыг байгуулах гэсэн асуудлыг шийдвэрлүүлэхээр хуулийн төсөлд оруулсан.

Коосэн сургууль нь сургалтын агуулгаа эрдэм шинжилгээний хөгжилд нийцүүлэхийн тулд шаардлагатай судалгааг явуулах талаар зорьж ажиллах бөгөөд Коосэн сургуульд технологийн инженер болгох мэргэжлийн сургалт төдийгүй нийгэм дэх бие хүн болоход шаардлагатай боловсрол хүмүүжлийг олгох ерөнхий боловсролын сургалтыг ч явуулах юм.

Коосэн сургууль нь технологийн инженерийг бэлтгэх зорилго бүхий мэргэжлийн практик боловсрол олгох сургалтанд гол анхаарлаа хандуулдаг боловсролын байгууллага тул мэргэжлийн түвшинд ажлын дадал чадвар олгох сургалтын байгууллага буюу дан ганц нэг чиглэлийг барьсан дээд боловсролын байгууллага болох юм.

Коосэн сургууль нь мэргэжлийн ур чадварыг өндөр түвшинд заан сургаж, ажил мэргэжилд шаардлагатай дадал чадварыг эзэмшүүлэх зорилготойгоор дунд сургууль төгссөн байх шалгуур үзүүлэлттэйгээр элсэн орж болох 5 жилийн сургалттай дээд мэргэжлийн боловсролын байгууллага байх болно.

Энэ нь 5 жил үргэлжилсэн цогц сургалтаар ерөнхий боловсрол болон суурь боловсролыг үр дүнтэй болгож, мэргэжлийн боловсролыг хангалттай олгон ингэснээрээ сургалтын зорилгоо бүрэн дүүрэн хэрэгжүүлэхээр тооцсон хэрэг юм.

Хуулийн төслийг боловсруулахдаа Япон Улсын “Сургуулийн боловсролын тухай хуулийн тайлбар, нэмж засварласан 4 дэх хэвлэл, Сүзүки Исао-гийн эмхтгэл”, “Япон Улсын Сургуулийн боловсролын тухай хуулийн Аравдугаар бүлэг, 2014 онд нэмэлт өөрчлөлт оруулсан”, “Коосэн Стандарт” зэрэг баримт бичгүүдийг судалсан болно.

Дээр дурдсан Дээд боловсролын тухай хуульд нэмэлт өөрчлөлт оруулах тухай хуулийн төсөл боловсруулах үндэслэл, шаардлагыг харгалзан уг хуульд дараах тодорхой зохицуулалтыг тусгах нь зүйтэй гэж үзлээ. Үүнд:

Коосэн сургуулийг төгсөгч нь дүйцсэн бакалаврын шашлалтай байх

Нарийн мэргэжлийн технологийн дээд сургууль байх

5 жилийн сургалттай технологийн дээд сургуульд дунд боловсролтой иргэнийг элсүүлж болно

Дүйцсэн бакалаврын сургалт 110 аас доошгүй багц цаг байна

Мэргэшсэн инженер зааж болно

Дүйцсэн бакалаврын шатлал

Дүйцсэн бакалаврын төгсөгч, кредит тооцож их дээд сургуульд шилжин орж суралцаж болно.

Хоёр.“Дээд боловсролын тухай хуульд нэмэлт, өөрчлөлт оруулах тухай хууль”-ийн төслийн ерөнхий бүтэц, зохицуулах харилцаа, хамрах хүрээ:

Дээд боловсролын тухай хуульд нэмэлт, өөрчлөлт оруулах тухай хуулийн төсөл нь 7 зүйлтэй байна.

Хуулийн төслийн 1 дүгээр зүйлд Коосэн сургуулийг төгсөгч нь дүйцсэн бакалаврын шашлалтай байх бөгөөд төгсөгч нь бакалаврын зэрэг биш харин дүйцсэн бакалаврын зэрэгтэй төгсөнө. Төгсөгч бакалавр зэрэг авахыг хүсвэл үргэлжлүүлэн 2 жил суралцах тухай зохицуулалтыг тусгана.

Хуулийн төслийн 2 дугаар зүйлд Нарийн мэргэжлийн технологийн дээд сургууль байх заалтыг тусгана. Одоо Монгол Улсад технологийн дээд сургуулийн үйл ажиллагааг тодорхой болгон зааглан Коосэн сургалт нь нарийн мэргэжлийн технологийн дээд сургуульд үйл ажиллагаагаа явуулахыг тодорхой зааж өгсөн.

Хуулийн төслийн 3 дугаар зүйлд 5 жилийн сургалттай технологийн дээд сургуульд дунд боловсролтой иргэнийг элсүүлж болохоор заалаа.

Хуулийн төслийн 4 дүгээр зүйлд дүйцсэн бакалаврын сургалт 110 аас доошгүй багц цаг байхаар оруулав.

Хуулийн төслийн 5 дугаар зүйлд мэргэшсэн инженер хичээл заах, профессор цол олгох. Коосэн сургалтанд тухайн салбарт ажиллаж байгаа инженерүүдийг өргөн хүрээтэй ажиллуулдаг онцлогийг харгалзан үйлдвэрлэл дээр ажиллаж байгаа инженерийг багшлах бололцоогоор хангах, сургалт

үйлдвэрлэлийг хөргжүүлэх зорилгоор мэргэшсэн инженерийг ажиллуулах, ажиллах нөхцөл бололцоогоор хангахын тулд шаардлагатай тохиолдолд профессор цол шууд олгохыг тусгав.

Хуулийн төслийн 6 дугаар зүйлд дүйцсэн бакалаврын шатлалтай байхаар тусгав.

Хуулийн төслийн 7 дугаар зүйлд дүйцсэн бакалаврын төгсөгч, кредит тооцож их дээд сургуульд шилжин орж суралцаж бакалаврын зэрэг авч болохоор заав.

Гурав.Хуулийн төсөл батлагдсаны дараа үүсч болох нийгэм, эдийн засгийн үр дагавар:

Энэхүү хуулийн төсөл батлагдсанаар УИХ-аас баталсан Засгийн газрын үйл ажиллагааны хөтөлбөр, төрөөс боловсролын салбарт баримтлах бодлогын баримт бичигт тусгагдсан олон талт дээд боловсрлын хэлбэрүүдийг хэрэгжүүлэх, инженерийн дээд түвшний боловсрол олгох зорилтууд хэрэгжих эрх зүйн үндэс бүрдэж, улмаар улс орны нийгэм эдийн засагт доорх эерэг үр дүн гарна гэж үзэж байна.

Нийгмийн үр дагавар:
Төрөөс боловсролын салбарт баримтлах нэгдсэн бодлогыг хэрэгжүүлэх хүрээнд Коосэн хэмээх инженерийн дээд түвшний боловсрол олгох, шинэ тогтолцоо бий болно.
Бүрэн дунд боловсрол эзэмшээд инженер болох биш 9 дүгээ анги төгсөөд 15 настай сурагч дээд түвшний инженерийн дээд боловсролыг бага наснаасаа эхлэн эзэмших нөхцөл бүрдэнэ.
Онолын хичээлээс илүүтэйгээр практик дадлагыг түлхүү үзэх учир сайн боловсорсон инженер бий болно.
Дотоодын чадварлаг инженер олноор бий болсноор гадаадын ажиллах хүчийг орлоно.
Нийгмийн ухааны салбарыг тахин шүтэх хандлагыг өөрчилж, экспортыг дэмжих, импортыг орлох үйлдвэрлэл хөгжүүлэхэд шаардлагатай дотоодын инженертэй болно.

Эдийн засгийн үр дагавар:
Коосэн төгссөн инженер олноор бий болсноор одоо нэн шаардлагатай байгаа 38000 ажиллах хүчнийг орлох боломжийг дэс дараатайгаар шийдэх гарцыг бий болгоно.
Ажиллах хүчний хомсдолд байгаа манай орны хувьд энэ орон зайг нөхөхийн тулд гадаадаас ажиллах хүч их хэмжээгээр авдаг байдлыг багасгана.
Өндөр түвшний мэргэжлийн ажилтан байхгүйн улмаас гадаадад гарч ажиллах явдал байсаар байна. Энэхүү гадаад руу чиглэсэн оюуны өндөр чадамжтай ажиллах хүчнийг дотооддоо тогтоон барихын тулд Коосэн сургалтын боловсрол нь хувь нэмрээ оруулна.
Хуулийн төсөл батлагдсанаар Монгол Улсын дээд боловсролын салбарын бүтээмж, өрсөлдөх чадвар нэмэгдэж, хөрөнгө оруулалт ихээр шаардагддаг энэ салбарын эрх зүйн орчин урт хугацаанд тогтвортой байх нөхцөл бүрэлдэж, хөрөнгө оруулалт ихээр нэмэгдэж, улмаар энэ салбараас улс орны эдийн засаг, нийгмийн хөгжилд оруулах хувь, нэмэр өсч, цаашид эдийн засгийн тогтвортой өсөлт хадгалагдах боломж бүрдэж, иргэдийн амьжиргааны түвшин тогтвортой дээшилнэ гэж үзэж байна.
Түүнчлэн хуулийн төсөл батлагдсанаар улсын төсвийн зарлага ямар нэг байдлаар нэмэгдэхгүй болно.

Дөрөв.Хуулийн төсөл Монгол Улсын Үндсэн хууль болон бусад хуультай хэрхэн уялдах, түүнийг хэрэгжүүлэх зорилгоор цаашид шинээр боловсруулах буюу нэмэлт, өөрчлөлт оруулах, хүчингүй болгох хууль тогтоомжийн талаар:

Хуулийн төсөл нь Монгол Улсын Үндсэн хууль болон бусад хууль тогтоомжтой нийцэж байгаа

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Төсөл

МОНГОЛ УЛСЫН ХУУЛЬ

2015 оны ... дугаар
Улаанбаатар
сарын . . . -ны өдөр
хот

**ДЭЭД БОЛОВСРОЛЫН ТУХАЙ ХУУЛЬД НЭМЭЛТ,
ӨӨРЧЛӨЛТ ОРУУЛАХ ТУХАЙ**

1 дүгээр зүйл. Дээд боловсролын тухай хуульд доор дурдсан агуулгатай дараах зүйл, хэсэг, заалт нэмсүгэй:

3.3 дугаар зүйл.

Коосэн сургуулийг төгсөгч нь дүйцсэн бакалаврын шашлалтай байх.

4.3 дугаар зүйл.

Нарийн мэргэжлийн технологийн дээд сургууль байх.

7.1 дүгээр зүйл.

5 жилийн сургалттай технологийн дээд сургуульд дунд боловсролтой иргэнийг элсүүлж болно.

дугаар зүйл.

Дүйцсэн бакалаврын сургалт 110 аас доошгүй багц цаг байна.

13.1 дугаар зүйл.

Мэргэшсэн инженер зааж болно.

15.1 дүгээр зүйл.

Дүйцсэн бакалаврын шатлал.

.... дугаар зүйл.

Дүйцсэн бакалаврын төгсөгч, кредит тооцож их дээд сургуульд шилжин орж суралцаж болно.

2 дугаар зүйл. Энэ хуулийг 2015 оны . . дүгээр сарын . . -ний өдрөөс эхлэн дагаж мөрдөнө.

ГАРЫН ҮСЭГ

Appendix 9 Kosen Education Systems except the Common Curriculum

Боловсрол, соёл, шинжлэх ухааны
сайдын 2010 оны 01 дүгээр сарын 21-ний
өдрийн 26 тоот тушаалын хавсралт

Дээд боловсролын сургалтын байгууллагын ангилал тогтоох журам
Нэг. Нийтлэг зүйл

1.1 Боловсролын тухай хуулийн 15 дугаар зүйл, Дээд боловсролын тухай хуулийн 4 дүгээр зүйлд заасны дагуу дээд боловсролын сургалтын байгууллагын ангиллыг тогтоохтой холбогдсон харилцааг зохицуулахад энэхүү журмыг баримтлана.

1.2. Өмчийн хэлбэр харгалзахгүй дээд боловсролын сургалтын ажил эрхлэх бүх байгууллага энэхүү журмын дагуу ангилал тогтоох үйл ажиллагаанд хамрагдана.

1.3. Коллежийн ангилалд дээд боловсролын сургалтын байгууллагад тавигдах нийтлэг шаардлагыг бүрэн хангасан сургуулийг бүртгэнэ.

1.4. Дээд сургуулийн ангилалд энэ журмын хоёр, гуравдугаар бүлэгт заасан нийтлэг болон нэмэлт шаардлагыг бүрэн хангасан сургуулийг бүртгэнэ.

1.5. Эрдэм шинжилгээ-сургалтын хэв шинжтэй их сургуулийн ангилалд энэ журмын хоёр, дөрөвдүгээр бүлэгт заасан нийтлэг болон нэмэлт шаардлагыг бүрэн хангасан сургуулийг бүртгэнэ.

1.6. Эрдэм шинжилгээ-сургалт-үйлдвэрлэлийн хэв шинжтэй их сургуулийн ангилалд энэ журмын хоёр, дөрөв, тавдугаар бүлэгт заасан нийтлэг болон нэмэлт шаардлагыг бүрэн хангасан сургуулийг бүртгэнэ.

Хоёр. Дээд боловсролын сургалтын байгууллагад
тавигдах нийтлэг шаардлага

Дээд боловсролын сургалтын байгууллага нь дараах нийтлэг шаардлагыг хангасан байна.
2.1. Хууль эрх зүйн орчны талаар:
2.1.1. Боловсролын асуудал эрхэлсэн Засгийн газрын гишүүний баталсан үлгэрчилсэн дүрмийн дагуу байгуулагдсан сургуулийн удирдах зөвлөлтэй байна.

Удирдах зөвлөл нь сургуулийн үйл ажиллагаатай уялдсан, зохих журмын дагуу албан хэрэг хөтлөлтийн шаардлагыг хангасан өөрийн болон сургуулийн онцлогийг тусгасан үлгэрчилсэн дүрэмд нийцсэн өөрийн дүрэмтэй байна.

2.1.2. Боловсролын асуудал эрхэлсэн Засгийн газрын гишүүний баталсан үлгэрчилсэн дүрэмд нийцсэн сургуулийн дүрэмтэй байна.

Сургуулийн дүрмэнд зохион байгуулалтын бүтцийн үндсэн болон бусад нэгжийн үүрэг хариуцлагыг тогтоож, ашгийн төлөө, ашгийн төлөө бус шинжийг тодорхойлж, сургуулийн дүрмийн сангийн тухай тусгасан байна. Үүсгэн байгуулах гэрээ, дүрмэндээ холбогдох хууль тогтоомжид заасны дагуу өөрчлөлт оруулсан, дүрмийн сан, оршин байгаа газраа өөрчилсөн бол энэ тухайгаа хуанлийн 14 хоногийн дотор Боловсрол, соёл, шинжлэх ухааны яаманд мэдэгдэж, улсын бүртгэлд өөрчлөлт оруулсан байна.

2.1.3. Сургууль нь хөдөлмөрийн харилцаа, дотоод үйл ажиллагааг зохицуулсан холбогдох хууль тогтоомжид нийцсэн дотоод журамтай байна.

2.1.4. Сургуулийн захиргаа, багшийн хооронд байгуулсан хөдөлмөрийн гэрээтэй байна.

2.1.5. Сургуулийн эрхэм зорилго, зорилтыг тодорхойлсон сургуулийг хөгжүүлэх ойрын, дунд, урт хугацааны стратеги төлөвлөгөөтэй байж түүнийг хэрэгжүүлэх үйл ажиллагааны чиглэл, үр дүнг тооцож хэвшсэн байна.

2.1.6. Багшийн ёс зүйн дүрэмтэй байна.

2.1.7. Оюутан бүртэй сургах тухай гэрээ байгуулсан байна.

2.1.8. Оюутны ёс зүйн дүрэмтэй байна.

2.1.9. Санхүүгийн үйл ажиллагаанд 2 жил тутам аудит хийлгэсэн байна. Сургуулийн төсөв нь сургалтын төлбөрөөс гадна хууль тогтоомжоор зөвшөөрсөн санхүүгийн бусад эх үүсвэртэй байна.

2.1.10. Сургууль хөгжүүлэх сантай байж болно. Сангийн дүрэм нь удирдах зөвлөлөөр хэлэлцэгдэж батлагдсан байна.

2.1.11. Боловсрол, соёл, шинж:лэх ухааны яамнаас баталсан Дээд боловсролын диплом олгох журам, дипломын загварыг мөрддөг байна.

2.1.12. Коллежид сургалт-арга зүйн зөвлөл ажиллана. Сургалт арга зүйн зөвлөл нь өөрийн дүрэмтэй байна.

2.1.13. Номын сангийн дүрэмтэй байна

2.1.14. Оюутны байрны дүрэмтэй байна.

2.2. Сургуулийн бүтэц, сургалтын зохион байгуулалтын талаар:

2.2.1. Дээд боловсролын сургалтын байгууллагын үндсэн нэгж нь тэнхим, лаборатори байхаар зохион байгуулсан байна.

2.2.2. Сургалтын чанарын баталгаажуулалт, хяналт-шинжилгээ, үнэлгээний орон тооны нэгжтэй эсвэл хариуцсэн ажилтантай байна.

2.2.3. Оюутны элсэлтийн журмыг жил бүр баталж мөрддөг байна.

Боловсрол, соёл, шинжлэх ухааны яамнаас батласан жил бүрийн элсэлтийн хяналтын тоог мөрддөг байна.

2.2.4. Боловсрол, соёл, шинжлэх ухааны яамаар хянуулж, зөвшөөрөл авсан сургалтын хэлбэр, мэргэжлийн чиглэл /индекс/ бүрээр сургалтын төлөвлөгөө, хичээлийн хөтөлбөртэй байна. Хичээлийн жилд мөрдөх баталгаажуулсан хичээлийн хуваарьтай байна. Сургалтын багц цагийг журамд нийцүүлж нэвтрүүлсэн байна.

2.2.5. Оюутны мэдлэг, чадвар, дадлыг Боловсрол, соёл, шинжлэх ухааны яамнаас тогтоосон журмын дагуу үнэлдэг байна.

2.2.6. Сургуулийн захирлын баталсан сургалтын зохион байгуулалт, дадлагын хөтөлбөр, дүрмийг мөрддөг байна.

2.3. Багшийн талаар:

2.3.1. Багшийн ажлын ачааллыг тооцох журмыг нэвтрүүлж хэвшүүлсэн байна. Багшийн ажлын ачааллыг тооцох журамд хичээлийн жилд гүйцэтгэх сургалт, эрдэм шинжилгээ, мэргэжлийн, аж ахуйн нэгж, байгууллага, иргэнд соёл, боловсролыг түгээн дэлгэрүүлэх, сурталчлах ажлын ачааллыг зааж өгсөн байна.

2.3.2. Нийт багш нарын 75-аас доошгүй хувь нь үндсэн багш байна.

/Үндсэн багш гэж Дээд боловсролын тухай хуулийн 13 дугаар зүйлийн 13.3 заалтын дагуу тухайн сургуулийн багшийн албан тушаалд ажиллахаар захирлын тушаалаар баталгаажиж, төрийн үйлчилгээний цалингийн сүлжээгээр цалинждаг /төрийн өмчийн сургуульд/, үндсэн сургуулиар дамжуулж нийгмийн даатгалаа төлдөг, эрдэм шинжилгээ, сургалт, мэргэжлийн, аж ахуйн нэгж, байгууллага, иргэнд соёл, боловсролыг түгээн дэлгэрүүлэх, сурталчлах ажлыг цогцоор явуулдаг багшийг хэлнэ. /

2.3.3. Багш магистраас доошгүй зэрэгтэй байна.

2.3.4. Нэг багш мэргэжлийн дагуу улиралд 3-аас илүүгүй хичээл заана.

2.3.5. Багш бүр хөдөлмөрийн гэрээнд заасан ажил үүргийн хүрээнд боловсруулсан ажлын байрны тодорхойлолтыг мөрддөг байна.

2.3.6. Ажлын байрны тодорхойлолтод тусгасан ажлын байрны нөхцлийг сургуулийн зүгээс бүрэн хангаж биелүүлсэн байна.

2.4. Оюутны талаар:

2.4.1. Оюутны эрх, ашиг сонирхолыг хамгаалах, тэдний төлөөлөл бүхий өөрийн удирдлагын байгууллага /оюутны холбоо, зөвлөл/-тай байна.

2.4.2. Оюутны өөрийн удирдлагын байгууллага нь үйл ажиллагаа явуулах, ажиллах нөхцөл бололцоогоор хангасан ажлын өрөөтэй, үйл ажиллагааных нь санхүүжилтийн асуудал шийдвэрлэгдсэн, оюутны нийтийн тээврээр хөнгөлөлттэй зорчих, эрүүл мэндийн үйлчилгээг авах, сурч буй мэргэжлийн чиглэлээр дадлага хийх, хөдөлмөр эрхлэхэд зуучлахад чиглэсэн үйл ажиллагаа тогтмолжсон байна.

2.4.3. Сургууль өөрийн дотуур байртай байх бөгөөд Стандартчилал, хэмжил зүйн үндэсний төвөөс баталсан Оюутны дотуур байрны үйлчилгээний стандартын шаардлагуудыг хангасан байна.
2.4.4. Сургууль оюутны дотуур байргүй бол дотуур байраар хангагдах шаардлагатай оюутнуудыг холбогдох байгууллагатай гэрээ байгуулж, байраар хангасан байна.
2.4.5. Оюутны нийгэм, соёл, спортын арга хэмжээг тогтмол зохион байгуулдаг, халдварт өвчин, нийгмийн хорт зуршлаас урьдчилан сэргийлэх чиглэлээр лекц, семинар, бусад арга хэмжээ улирал бүр тогтмолжсон байна. Мэргэжлийн чиглэлийн дагуу мэргэшүүлэх секц, дугуйлан хичээллүүлдэг байна.
2.4.6. Оюутанд сурлагын амжилтыг харгалзан сургалтын төлбөрийн хөнгөлөлт болон тэтгэлэг, тусламж үзүүлэх талаар холбогдох эрх зүйн баримт бичиг баталж хэрэгжүүлдэг байх, үр дүнг оюутны төлөөллийн байгууллагадаа тайлагнадаг байна.
2.4.7. Төгсөгчдийг ажлын байраар хангах, зуучлах нэгжтэй эсвэл ажилтантай байх, төгсөгчдийн ажлын байрны судалгааг гаргаж, төгссөнөөс хойш 6 сарын болон нэг жилийн дотор ажлын байраар хэрхэн хангагдсан тухай судалгаа тогтмолжсон байна.
2.5. Сургалтын орчин, материаллаг баазын талаар:
2.5.1. Сургалтын зориулалтаар эзэмших барилга байгууламж нь Олон нийт иргэний барилгын стандартад заасан байр, талбайн хэмжээ, эрүүл ахуйн нормативыг хангасан байх ба үл хөдлөх хөрөнгийн бүртгэлийн гэрчилгээтэй, үүсгэн байгуулагчаас сургуулийн эзэмшилд шилжүүлсэн өөрийн эзэмшлийн сургалтын байртай байна.
2.5.2. Сургуулийн эзэмшил газрын кадастрын зураг хийлгэж, эзэмшил газрыг холбогдох байгууллагаар баталгаажуулсан байна. Сургалтын зориулалт бүхий эдэлбэр газарт аж ахуйн үйл ажиллагаа эрхлэхгүй байна.
2.5.3. Сургалт явуулж буй мэргэжлийн лабораторийг стандарт шаардлагын дагуу байгуулж тоноглосон байна.
2.5.4. Хөгжлийн бэрхшээлтэй иргэн, багш, оюутныг нэвтрүүлэх зориулалтын шат, ариун цэврийн өрөөтэй байна.
2.5.5. Эрүүл ахуйн шаардлага хангасан нийтийн хоолны үйлчилгээний цэгтэй байна.
2.5.6. Стандартын шаардлага хангасан биеийн тамирын танхимтай байна. Биеийн тамирын танхимгүй тохиолдолд холбогдох байгууллагатай гэрээ байгуулж, сургалт явуулдаг байна.
2.5.7. Дээд боловсролын сургалтын байгууллагын үйл ажиллагаатай холбоотой бичиг баримт хадгалах зориулалтын өрөөтэй, ажил хариуцсан мэргэжлийн ажилтантай байна.
2.5.8. Оюутны тоо нь сургуулийн хүчин чадалд тохирсон байна.Ээлжийн ашиглалтын коэффицент 1.5-аас ихгүй байна. /Ээлж ашиглалтын коэффициентийг нийт оюутны тоог хичээллэх суудлын тоонд хувааж гаргана./
2.5.9. Стандартчилал, хэмжил зүйн үндэсний төвөөс 2007 онд баталсан "Номын сангийн орчны нөхцөл, үйл ажиллагаанд тавих шаардлага"-ыг хангасан номын сантай байна. Номын

сан нь электрон каталоги бүхий мэдээллийн баазтай, цахим хэлбэрээр ашиглах номын фондтой байна.

2.5.10. Боловсрол, соёл, шинжлэх ухааны сайдын 2005 оны 441 дүгээр тушаалаар батлагдсан номын сангийн уншлага, үйлчилгээнд мөрдөх бүртгэл, маягтуудыг хөтөлж, үйл ажиллагаандаа хэвшүүлсэн байна.

2.5.11. Мэргэжлийн номын санчтай байна.

2.5.12. Барилга байгууламжийн галын аюулгүй байдлын шаардлагыг хангасан байна.

2.6. Мэдээллийн технологийн талаар:

2.6.1. Сургуулийн үйл ажиллагаа, сургалтад цахим хэлбэрийг ашигладаг байна.

2.6.2. Сургалт явуулж буй мэргэжилд холбогдох тусгай болон албан хэрэгцээний / office/ зориулалтын хэрэглээний программтай байна.

2.6.3. Сургуулийн удирдлагын мэдээллийн системийн байнга ашигладаг программ хангамжтай байна.

2.6.4. Багш бүр өөрийн электрон шуудангийн хаягтай, цахим /хувийн вэб/ хуудастай түүнийгээ сургалтандаа ашиглаж хэвшсэн байна.

2.6.5. Оюутан бүр электрон шуудангийн хаягтай байна.

2.6.6. Сургууль нь динамик вэб сайттай, түүнд байршуулах мэдээллүүд нь байнга шинэчлэгддэг байна**.**

2.6.7. Компьютерийн дадлагын хичээлд нэг компьютерт 2-оос илүүгүй оюутан ногдохоор сургалтыг зохион байгуулдаг байна.

2.6.8. Комьпютерийн дадлагын хичээлд нэг компьютерт 2-оос илүүгүй оюутан ногдохоор сургалтыг зохион байгуулдаг байна.

2.6.9 Багш нар ажлын шаардлага хангасан хурд сайтай, интернет холболттой компьютерээр хангагдсан байна. Хоёр багшийн дунд нэг компьютер байж болно**.**

2.6.10. Бүх хичээлийн сургалтын материалыг цахим хэлбэрт шилжүүлсэн байна.

2.6.11. Бүх хичээлийн сургалтын материалыг цахим хэлбэрт шилжүүлсэн байна.

2.6.12. Бизнесийн удирдлагын чиглэлээр сургалт эрхэлдэг сургуулиуд цахим арилжааны талаар сургалтын хөтөлбөртөө оруулсан байна.

Гурав. Дээд сургуулийн ангилалд тавигдах нэмэлт шаардлага

3.1. Дээд сургууль нь Дээд боловсролын тухай хуулийн 4 дүгээр зүйлийн 4.3-д заасан шинжлэх ухааны тодорхой чиглэлээр судалгаа, шинжилгээний ажил явуулж дипломын болон бакалаврын сургалт эрхэлдэг, сургалт-эрдэм шинжилгээний байгууллага байна.

3.2. Магистрын сургалт явуулдаг бол магистрын хөтөлбөрт хамаарах хичээлийг доктор зэрэгтэй багш хөтлөн явуулдаг байна.

3.3. Үндсэн багшийн 15-аас доошгүй хувь нь докторын зэрэгтэй байна.

3.4. Шинжлэх ухааны тодорхой чиглэлээр судалгаа, шинжилгээ явуулдаг, эрдэм шинжилгээний асуудал хариуцсан нэгжтэй байна.
Нэгж нь оюутан, багш нарын эрдмийн бүтээлийг үнэлэх, цаашдын судалгааны ажлын хүрээг өргөтгөх хүрээнд дэмжлэг үзүүлэх, эрдэм шинжилгээний хуралд оюутан, багш нараа тогтмол хамруулдаг байна.

3.5 Дээд сургууль эрдмийн зөвлөлтэй байна. Эрдмийн зөвлөл нь дүрэмтэй байна. Эрдмийн зөвлөлийн гишүүдийн 50-иас доошгүй хувь нь сургуулийн төлөөлөл, үлдсэн хувь нь аж ахуйн нэгж, төрийн болон төрийн бус байгууллага, салбарын эрдэмтэн судлаачдын төлөөлөл байна. Эрдмийн зөвлөлийн гишүүдийн 70-аас доошгүй хувь нь докторын зэрэгтэй байна.

Дөрөв. Их сургуулийн ангилалд тавигдах шаардлага

4.1. Их сургууль нь Дээд боловсролын тухай хуулийн 4 дүгээр зүйлийн 4.2-д заасны дагуу үйл ажиллагаа эрхэлдэг хуулийн этгээд байна.
4.2. Гурваас доошгүй мэргэжлийн чиглэлээр докторын сургалт эрхэлдэг байна. Магистр, докторын хөтөлбөрийг хариуцсан нэгжтэй, хөтөлбөрт хамаарах бүх хичээлийг докторын зэрэгтэй багш хөтлөн явуулдаг байна;
4.3. Профессорын багт тулгуурласан зохион байгуулалтын нэгжтэй байж болно.
4.4. Нийт багш нарын 70-аас доошгүй хувь нь эрдэм шинжилгээний ажил гүйцэтгэдэг байна.
4.5. Үндсэн багш нарын 30-аас доошгүй хувь нь докторын зэрэгтэй байна.
4.6. Нийт суралцагчдын 40-өөс доошгүй хувь нь судалгааны ажил хийдэг байна.
4.7. Их сургууль эрдмийн зөвлөлтэй байна. Эрдмийн зөвлөлийн гишүүдийн 50-иас доошгүй хувь нь сургуулийн төлөөлөл, үлдсэн хувь нь аж ахуйн нэгж, төрийн болон төрийн бус байгууллага, салбарын эрдэмтэн судлаачдын төлөөлөл байна. Эрдмийн зөвлөлийн гишүүдийн 70-аас доошгүй хувь нь докторын зэрэгтэй байна
4.8. Техник технологийн чиглэлийн төрийн өмчийн их сургуулийн хувьд сургуулийн хэмжээнд гүйцэтгэдэг судалгаа, боловсруулалтын ажлын дотор өндөр технологийн чиглэлээр гүйцэтгэсэн ажлын эзлэх хувь 10-аас доошгүй байна.
4.9. Шинжлэх ухааны хэд хэдэн холбогдох чиглэлээр төрөлжсөн лабораторитой байна.
4.10. Нийт номын фондын 5-аас доошгүй хувь нь дотоод, гадаадын эрдэм шинжилгээний сэтгүүл байна.

4.11. Сургууль нь дангаар буюу бусад их сургууль, эрдэм шинжилгээний байгуулагатай хамтран эрдэм шинжилгээний сэтгүүл эрхлэн гаргадаг байна.
4.12. Нийт эрдэм шинжилгээний бүтээлд гадаад орны эрдэм шинжилгээний сэтгүүлд нийтлүүлсэн болон оюуны өмчийн гэрчилгээ, патент авсан бүтээлийн эзлэх хувь 3-аас доошгүй хувь байна.
4.13. Эрдэм шинжилгээний хурал, семинарыг тусгай хөтөлбөрийн дагуу тогтмол зохион байгуулдаг байна.
4.14. Багш, оюутны болон бусад чиглэлийн эрдэм шинжилгээний ажлыг дэмжих, цаашид хөгжүүлэх зориулалт бүхий сантай байж болно. Сангийн эх үүсвэр нь хуулийн хүрээнд гадаад, дотоодын иргэд байгууллагын санхүүжилт, хөрөнгө оруулалт, хандив, тусламж байна. Сангийн үйл ажиллагааг зохицуулах журмыг эрх бүхий байгууллагаас санал авч, сургуулийн удирдах зөвлөлөөр батласан байна.

Тав. Эрдэм шинжилгээ-сургалт-үйлдвэрлэлийн их сургуулийн ангилалд тавигдах нэмэлт шаардлага

5.1. Боловсрол, соёл, шинжлэх ухааны сайдын 2007 оны 12 дугаар сарын 04-ны өдрийн "Үнэлгээний үзүүлэлт батлах тухай" 463 дугаар тушаалаар баталсан үнэлгээний шаардлагыг хангасан байна.
5.2. Судалгааны ажлын чиглэлээр өөрийн 3-аас доошгүй үйлдвэрлэлийн нэгжтэй, 3-аас доошгүй судалгааны хүрээлэнтэй байна.

Зургаа. Ангилал тогтоох үйл ажиллагаа

6.1. Ангиллын хүсэлт гаргаж буй сургууль нь дараах баримт бичгийг бүрдүүлж Боловсрол, соёл, шинжлэх ухааны яамны дээд боловролын асуудал хариуцсан нэгжид ирүүлнэ.Үүнд:
а/ Өргөдөл
б/ Тухайн ангиллын шаардлагыг хангаж байгаа үндэслэл, танилцуулга, улсын бүртгэлийн гэрчилгээний болон сургалт эрхлэх тусгай зөвшөөрлийн гэрчилгээний хуулбар, ангиллын нийтлэг болон нэмэлт шаардлагыг заалт бүрээр хэрхэн хангаж буй тухайгаа дэлгэрэнгүй бичсэн тайлан
6.2 Боловсрол, соёл, шинжлэх ухааны яамны дээд боловсролын асуудал хариуцсан нэгж баримт бичгийн бүрдлийг шалгаж, бүрэн гүйцэд бол Боловсрол, соёл, шинжлэх ухааны сайдын тушаалаар шинжээчдийн ажлын хэсэг томилж ажиллуулна.
Баримт бичгийн бүрдэл дутуу тохиолдолд хүсэлт гаргагчид буцаана.
6.3. Шинжээчдийн бүрэлдэхүүнд Боловсрол, соёл, шинжлэх ухааны яамны дээд боловсрол, санхүү, хяналт, шинжилгээ-үнэлгээ, эрх зүйгээр мэргэшсэн нэгжийн дарга, мэргэжилтэн,

мэргэжлийн хяналтын ерөнхий газрын дээд боловсрол, хөдөлмөр, санхүү хариуцсан нэгжийн дарга, улсын байцаагчид, улсын төв, хотын номын сангийн мэргэшсэн ажилтнууд, дээд боловсролын сургалтын байгууллагын удирдлага, мэргэшсэн ажилтнууд, оюутны байгууллагын төлөөлөл, эрдэм шинжилгээний байгууллагын төлөөллөөс томилно. Сургалт эрхэлдэг салбарын төлөөллөөс саналын нь үндсэн дээр оролцуулж болно.

6.5. Шинжээчид дүгнэлт гаргана. Үнэлгээний заалтын 90 буюу түүнээс дээш хувьд "хангалттай "үнэлгээ авсан бол "хангалттай" гэж үзнэ.

6.6. Шинжээчдийн ажлын хэсэг дүгнэлтээ Боловсрол, соёл, шинжлэх ухааны яамны нэгжийн дарга нарын зөвлөлийн хуралдаанд танилцуулна.

6.7. Шинжээчдийн ажлын хэсгийн дүгнэлт, Боловсрол, соёл, шинжлэх ухааны яамны нэгжийн дарга нарын зөвлөлийн хуралдааны тэмдэглэлийг үндэслэн Боловсрол, соёл, шинжлэх ухааны сайд шийдвэр гаргана.

6.8. Мэргэжлийн хяналтын ерөнхий газрыг шалгалт, Боловсрол, соёл, шинжлэх ухааны яамны аттестатчиллын дүнгээр тухайн дээд боловсролын сургалтын байгууллага ангиллын шаардлагыг хангахгүй байгаа нь нотлогдсон бол тухайн сургуулийн ангиллыг Боловсрол, соёл, шинжлэх ухааны сайдын шийдвэрээр бууруулж болно.

--ooOoo—

Appendix 10 Examination of College of Technology, Institute of Engineering and Technology

受験者番号　　面接官名　　月　日

問題. 皆さんの前に磁石、クリップ、ストロー、セロテープ、輪ゴム、定規、はさみ、割りばし、タコ糸、風船、紙コップ、A4 用紙があります。ここに置いてある材料を使用して、ものづくりに挑戦していただきます（ここに置いてあるもの以外は使ってはいけない）。材料は、全部使う必要はなく、一つだけでモノを作っても良い。作品を展示し、その作品を作成するに至った経緯を（A4 用紙に書いて）説明してください。作品は時間内でできた途中までででも構わない。

制限時間は　　分（最後の５分は“まとめ”の時間とする）。

課題に取り組んでいる受験生の様子を注視して観察する。気付いた点があればメモをする。

1．まじめに取り組んでいる。

A:　　B:　　C:　　D:

2．作成に取り組んでいる様子。

メモ書きし（構想を紙に書いてから）取組む。

使用材料の取り扱い方、処理状態（後処理など）。

A:　　B:　　C:　　D:

3.作品に至った経緯

発想の変化、展開。

以後の発展性。

A:　　B:　　C:　　D:

4．質疑応答

（自分の考えをまとめて発表する。）

発表、受け答え、態度。

A:　　B:　　C:　　D:

5．その他

МОНГОЛ КООСЭН

Батлав: Сургалтын менежер: ..... П.Оюунцэцэг

ЭССЭ 1 Хугацаа 40 минут

КОД:

Доорх сэдвүүдээс дурын нэг сэдэв сонгон 250-иас дээш үгтэй эссэ бичнэ үү.

1. Техник, технологи бидний амьдралд
2. 10 жилийн дараах "БИ"
3. Хотын түгжрэл

МОНГОЛ КОСЭН

Батлав: Сургалтын менежер: ..... П.Оюунцэцэг

ЭЛСЭЛТИЙН ШАЛГАЛТ-I Хугацаа 60 минут

Сорилын цаасан дээр бичихийг хориглоно.

Сорил 1

1. 21 ба 35 тоонуудын хамгийн их ерөнхий хуваагчийг олно уу. (1 оноо)

   A. 7 B. 35 C. 105 D. 225 E. 21

2. x – ийн оронд ямар тоо байхыг олоорой. $\frac{2}{3}=\frac{x}{9}$ (1 оноо)

   A. 6 B. 9 C. 18 D. 27 E.12

3. 0.5(8) үет аравтын бутархайг энгийн бутархай болго. (1 оноо)

   A. $\frac{29}{50}$ B. $\frac{53}{90}$ C. $\frac{29}{58}$ D. $\frac{53}{99}$ E. $\frac{9}{50}$

4. Утгыг олоорой. $(3^2\cdot(3^2)^3):3^7=$ (1 оноо)

   A.9 B. 3 C. 6 D. 12 E. 1

5. Квадратын талбай 81см^2 бол түүний периметр хэдтэй тэнцүү байх вэ? (1 оноо)

   A. 9 B. 18 C. 24 D. 36 E. 6

6. Үл мэдэгдэх тооны $\frac{1}{2}$ –ийг $\frac{3}{4}$ –аар үржүүлэхэд 30 гарчээ. Үл мэдэгдэх тоог олно уу. (1 оноо)

   A. 40 B. 60 C. 80 D. 90 E. 120

7. Үржигдэхүүн болгон задал. $(a-2)^2-4a^2=$ (1 оноо)

   A. (- a-2)(3a-2) B. (a-2)(3a-2) C. (- a+2)(3a-2) D. (- a-2)(3a+2) E. (- a-2)(3a-2)

8. ABC гурвалжны AC, CB талууд дээр харгалзан M, N цэгүүдийг авч MN дундаж шугам татав. Хэрэв AB=6см бол MN –ийг олоорой. (1 оноо)

   A. 3 B.2 C.4 D. 5 E. 3.5

9. 70 сурагчийн 56 нь хөвгүүд бол бүх хүүхдийн хэдэн хувийг охид эзлэх вэ? (1 оноо)

   A. 80 B. 60 C. 40 D. 20 E. 50

10. 1,2,3,4,5 цифрүүдээр цифр давтагдахгүй 12-оор эхэлсэн хэчнээн таван оронтой тоо зохиох вэ? (1 оноо)

    A. 24 B. 16 C. 12 D. 8 E. 6

Сорил 2

1. $F(x)=0{,}5x+3$ функцын хувьд $F(2)+F(-2)$ утгыг олоорой. (3 оноо)

   A. 5 B. 2 C. 6 D. 4 E. 8

2. Үйлдлийг гүйцэтгэ. $\left(\left(-1\frac{1}{12}\right)+\left(-2\frac{1}{2}\right)\right):(-2)=$ (3 оноо)

   A. $\frac{43}{24}$ B. $\frac{43}{12}$ C. $-\frac{43}{24}$ D. $-\frac{43}{12}$ E. $\frac{19}{12}$

3. Тэгш өнцөгтийн талбай $S=x^2+4x-24$ томьёогоор илэрхийлэгдэнэ. Хэрэв $s=8$ бол $x-$ ийг олоорой. (3оноо)

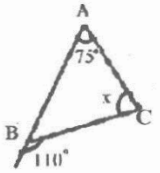
   A. 4 B. 3 C. 5 D. 6 E. 2

z

4. p –ийн ямар утганд $\left(\frac{2}{3}p;2\right)$ координаттай цэг $6x-5y=22$ тэгшитгэлтэй шулуун дээр орших вэ? (3 оноо)

A. -6 B. -4 C. 4 D. - 8 E. 8

5. ABC гурвалжны x өнцгийг олоорой. (3 оноо)



A. 35^0 B. 70^0 C. 105^0 D. 45^0 E. 55^0

6. Гурвалжны талууд 2:3:4 харьцаатай бөгөөд периметр нь 27 см бол талуудыг ол. (3 оноо)

A. $(14;6;7)$ B. $(6;9;12)$ C. $(9;6;12)$ D. $(6;12;9)$ E. $(4;8;15)$

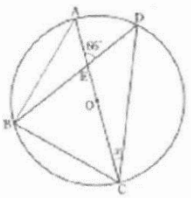
7. Ээжийн нас охины наснаас 5 дахин их ба таван жилийн дараа 3 дахин их болно. Охин хэдэн настай вэ? (3 оноо)

A. 3 B. 5 C. 6 D. 4 E. 7

8. $y=\frac{4}{x}$ ба $y=x$ - ийн графикуудын огтлолцлын цэгийг ол. (3 оноо)

A. $(2;2)$ B. $(-2;-2)$ C. $(-2;-2)\,(2;2)$ D. $(-2;2)$ E. $(2;-2)$

Сорил 3

1. $(-2^3):\left(\frac{3}{5}-\frac{1}{3}\right)$ илэрхийллийг бод. (1 оноо)
2. $\sqrt{21}\cdot\sqrt{7}-\frac{18}{\sqrt{12}}$ илэрхийллийг бод. (1 оноо)
3. $4x^2=(x+6)^2$ тэгшитгэлийг бод (1 оноо)
4. $y=\frac{3}{2}x^2$ функцийн тодорхойлогдох муж нь $-2\leqq x\leqq 4$ үед утгын мужийг ол. (1 оноо)
5. 

A, B, C, D нь O төвтэй тойрог дээр орших бөгөөд AC шулуун нь 0 төвийг дайрна. AC , BD шулуунуудын огтолцлын цэг E бөгөөд $\angle AED=66^0$, $AB=BC$ бол $x-$ийг ол. (2 оноо)

Appendix 11 Curriculum of Electrical and Electronic Engineering in Institute of Technology, Mongolian University of Science and Technology

Цахилгаан-Электроникийн Инженерийн анги
Ерөнхий эрдэм ба Мэргэжлийн хичээл

Хичээлийн нэр				Хичээлийн код	Англи нэршил	Кредит тоо	Курс тус бүрийн кредит тоо				
							1-р курс	2-р курс	3-р курс	4-р курс	5-р курс
Ерөнхий хичээл	Үндсэн хичээл	Эх хэл	Монгол хэл		Mongolian language	3	1	1	1		
			Уран зохиол		Mongolian literature	3	1	1			
		Нийгэм	Инженерийн ёс зүй		Engineering ethic	2					2
			Дэлхийн түүх		World history	2	1	1			
			Монголын түүх		Mongolian history						
			Газар зүй		Geography	2	2				
			Хэрэглээний шинжлэх ухаан		Social science	2	1	1			
			Улс төр, эдийн засаг		Politics and Economics	2		1	1		
			Олон улсын харилцааны он		International affairs	1				1	
		Математик	Алгебр		Algebra	4	4				
			Геометр		Geometry	3	3				
			Алгебр ба Геометр		Algebra and Geometry	3		3			
			Дифференциал ба Интеграл		Differentional and Integral Calculus	8		4	4		
		Байгалийн Шинжлэх ухаан	Физик		Physics	8	4	2	2		
			Хими		Chemistry	4	2	2			
			Биологи		Biology	2	2				
		Биеийн тамир	Биеийн тамир		Physical education	6	2	2	2		
			Эрүүл ахуй ба шинжлэх ухаан		Health and Science	4				2	2
		Соёл урлаг			Art	1		1			
		Гадаад хэл	Япон хэл		Japanese	14	4	4	4		
										1	1
			Япон хэлний өгүүлбэр зүй		Japanese writing	6		2	2	1	1
			Япон хэлний яриа		Japanese communication	4		1	1	1	1
			Англи хэл		English	8	2	2	2		
										1	1
			Англи хэлний өгүүлбэр зүй		English writing	5	1	1	1	1	1
			Англи хэл яриа		English communication	3	1	1	1		
		Сэтгэл зүй	Харилцан ярианы үндэс		Communication lecture	2	1		1		
			Харилцан ярианы дадлага		Communication seminar	2	1		1		
		Дэд нийлбэр				100	31	30	21	8	12
	Сонгох хичээл	Газар зүй			Geography	2				2	
		Хууль зүй			Law	2				2	
		Эдийн засаг			Economy	2				2	
		Философи			Philosopy	2				2	
		Түүх			History	2				2	
		Математикийн тусгай онол			Mathematics special	2				2	
		Байгалийн шинжлэх ухаан			Natural science	2				2	
		Дэд нийлбэр				14				14	
Тогтоосон кредитийн нийт тоо						130	31	30	21	36	12
Бүрдүүлэх кредитийн нийт тоо						104	31	30	21	10	12
Тусгай ажил						3	1	1	1		

Тусгай ажил				3	1	1	1		
Мэргэжлийн хичээл	Үндсэн хичээл	Хэрэглээний матетик 1		Applied mathematics 1	2				2	
		Хэрэглээний матетик 2		Applied mathematics 2	2				2	
		Хэрэглээний физик 1		Applied physics 1	2			2		
		Хэрэглээний физик 2		Applied physics 2	2				2	
		Цахилгаан соронзон орон 1		Electromagnetism 1	4			4		
		Цахилгаан соронзон орон 2		Electromagnetism 2	2				2	
		Цахилгаан хэлхээ 1		Electric Circuits 1	4	1	3			
		Цахилгаан хэлхээ 2		Electric Circuits 2	3					
		Цахилгаан хэлхээ 3		Electric Circuits 3	2			2		
		Цахилгаан хэлхээ 4		Electric Circuits 4	1				1	
		Цахилгаан хэлхээ 5		Electric Circuits 5	2				2	
		Мэдээллийн боловсруулалт		Information Processing	4	4				
		Програмчлал		Programming	2		2			
		Алгоритм		Algorithms	1			1		
		Электрон хэлхээ		Electronic Circuits	2			2		
		Электрон хэлхээ ба дизайн		Electronic Circuits and Design	1				1	
		Дижитал хэлхээ 1		Digital Circuits 1	1			1		
		Дижитал хэлхээ 2		Digital Circuits 2	1				1	
		Электроник		Electronics	2				2	
		Цахилгаан хэмжилт		Electric Measurements	2				2	
		Цахилгаан тоног төхөөрөмжийн техник 1		Electric Machinery & Apparatus 1	2			2		
		Цахилгаан тоног төхөөрөмжийн техник 2		Electric Machinery & Apparatus 2	2				2	
		Хяналтын инженерчлэл 1		Control Engineering 1	1					1
		Компьютерийн бүтэц ба дата боловсруулалт		Computer architecture and data processing	2				2	
		Холбооны инженерийн онол 1		Communication Engineering	1				1	
		Цахилгааны дадлага хичээл 1		Electric Exercises 1	2	2				
		Цахилгааны дадлага хичээл 2		Electric Exercises 2	1		1			
		Инженерийн туршилт 1		Engineering Experiments 1	3		3			
		Инженерийн туршилт 2		Engineering Experiments 2	4			4		
		Инженерийн туршилт 3		Engineering Experiments 3	4				4	
		Инженерийн туршилт 4		Engineering Experiments 4	2					2
		Инженерийн дизайны дадлага		Engineering Design Training	2					2
		Төгсөлтийн ажил		Graduation project	8					8
	Авах боломжтой кредит				76	7	9	18	26	13
	Сонгон хичээл	Цахилгаан станц болон подстанцийн инженерчлэл		Engineering for Power Station and Substation	1					1
		Цахилгаан эрчим хүчний дамжуулалт ба хуваарилалт		Electric Power Transmission and Distribution	1					1
		Эрчим хүчний электроник		Power Electronics	1					1
		Цахилгаан ба электроникийн материал		Electric and Electronic Materials	2					2
		Эрчим хүчний электроник		Power Electronics	1					1
		Цахилгаан инженерчлэлийн дизайн		Design for Electrical Engineering	1					1
		Системийн инженерчлэл		System Engineering	1					1
		Хяналтын инженерчлэл 2		Control Engineering 2	1					
		Холбооны инженерчлэл 2		Communication Engineering 2	1					1
		Мэдээлэл зүйн онол		Information Theory	1					1
		Сүлжээний архитектур		Network Architecture	1					1
		Цахилгааны хууль дүрэм		Laws and Regulations for Electricity	1					1
		Квантын механик		Quantum Mechanics	2					2
		Байгаль орчины инженерийн хээрийн судалгаа		Field Research on Aquatic Environmental Engineering	1				1	
		Биотехнологийн ерөнхий онол		General Biotechnology	1					1
		Мехатроник		Mechatronics						1
		Дэд бүтцийн систем		Infrastructure System						1
					1				1	
		Бие даалт								
		Дэд нийлбэр			18	0	0	0	2	17
Тогтоосон кредитийн нийт тоо					92	7	9	18	28	30
Авах боломжтой кредитийн нийт тоо					90	7	9	18	27	29

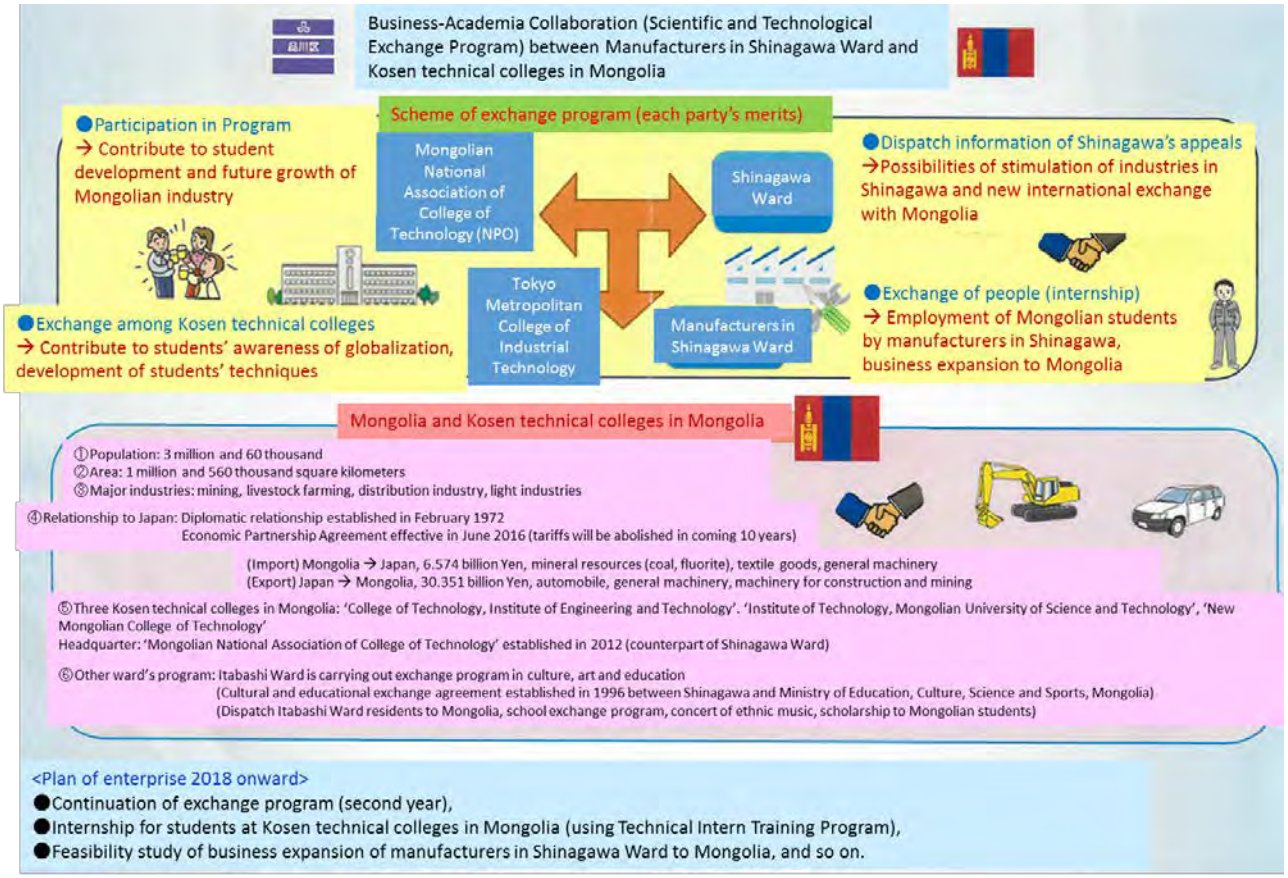
Appendix 12 List of Equipment in Electrical and Electronic Engineering in Institute of Technology, Mongolian University of Science and Technology

LIST OF THE PRODUCTS

Lot No.	Item No.	Name of the Products (English)	Name of the Products (日本語)	Quantity	Installation/ Set-up Service	Operation and Maintenance Training Service	Provision of After-Sales Service
1	1	Digital Multimeter	デジタルマルチデータ	6 unit(s)	NOT Required	NOT Required	Required
	2	Op-Amplifier Training Apparatus	オペアンプ実験装置	6 unit(s)	NOT Required	Required	Required
	3	Logic Circuit Training Apparatus	ロジック学習装置	6 unit(s)	NOT Required	Required	Required
	4	Pulse Circuit Training Apparatus	パルス回路実習装置	6 unit(s)	NOT Required	Required	Required
	5	Printed Circuit Board Processing Apparatus	基盤加工機	1 unit(s)	Required	Required	Required
	6	Multi Function Generator	ファンクションジェネレーター	6 unit(s)			Required
	7	Three-phase Thyrisor Converter Training Apparatus	三相サイリスタコンバータ実験装置	1 unit(s)			Required
	8	Brushless DC Motor Generator	ブラシレスDCモーター永久磁石フィールド発電機	1 unit(s)	NOT Required	Required	Required
	9	Power Electronics Training Equipment	パワーエレクトロニクス実験装置	1 unit(s)	NOT Required	Required	Required
	10	DC Power Circuit Training Apparatus	直流電源回路実習装置	1 unit(s)	NOT Required	Required	Required
	11	Three Phase AC Load Training Apparatus	三相交流計測負荷装置	1 unit(s)	NOT Required	Required	Required

1	12	Earth Leakage Circuit Breaker Training Apparatus	漏電実験装置	1 unit(s)	NOT Required	Required	Required
	13	Three-phase Motor Training Apparatus	三相モーター実験装置	1 unit(s)	NOT Required	Required	Required
	14	Variable Resistance Transformer (7.5A)	単相変圧器(7.5A)	1 unit(s)			
	15	Variable Resistance Transformer (3.7A)	単相変圧器(3.7A)	1 unit(s)			
	16	Cutting Machine for Laboratory	切断機	1 unit(s)			
	17	Band Saw	卓上帯鋸盤	1 unit(s)			
	18	Bench Lathe	卓上旋盤	1 unit(s)			

Appendix 13 Overview of Technology Exchange between Shinagawa-ward and Kosen in Mongolia (Industrial-Academia-Government Collaboration)



Appendix 14 Examination of Institute of Technology, Mongolian University of Science and Technology

Вариант А

1. $-72,52$ тооны бүхэл ба бутархай хэсгийг ол.
2. $\dfrac{4^{-4}\cdot 8^{-6}}{16^{-5}} =$
3. $\sqrt[3]{27\cdot 64}+\sqrt[4]{0,0016\cdot 16} =$
4. $\dfrac{(x+1)(x-6)}{x-3} > 0$ тэнцэтгэл бишийг бод.
5. $3\cdot 9^{2x+1}-26\cdot 9^{x}=1$ тэгшитгэлийг бод.
6. $\log_5 2 = a$; $\log_5 3 = b$ бол $\log_5 15$-ийг $a;b$ -ээр илэрхийл.
7. $f(x)=x^2+1$; $g(x)=3-x$ бол
   а) $(f\circ g)(x)$
   б) $(g\circ f)(x)$ эдгээрийг ол.
8. $y=3x-5$ функцийн урвуу функц y^{-1}-ийг ол.
9. 600 тооны натурал хуваагчдын тоог ол.
10. $C(-2;-8)$; $D(3;4)$ цэгүүд өгөгджээ. $\overrightarrow{CD}$ векторын координатыг ол. Мөн $\left|\overrightarrow{CD}\right|$-г ол.
11. ABC гурвалжны $b=3$; $c=4$; $\alpha=60^\circ$ бол a тал ба S_{ABC} -г ол.
12. $ABCD$ тэгш өнцөгтийн C оройн биссектрис AB талыг E цэгт огтлоно. Хэрэв $CE=6\sqrt{2}$ ба $AE=EB$ бол S_{ABCD} -г ол.

ШУТИС-ийн ТДС-ийн 1-р курст элсэх (9-р анги төгсөгчид)

Физикийн шалгалтын даалгавар

Хугацаа: 30 минут

1. Соронзон хальсанд 19.05см/с хурдтай бичлэг хийхэд 15минут болоод дуусчээ. Соронзон хальсны урт ямар байх вэ?

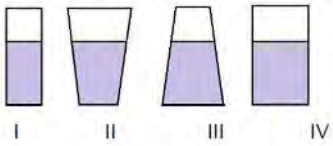
2. 2 литр багтаамжтай хувинд байгаа ургамлын тосны жин ямар байх вэ? Ургамлын тосны нягт $\rho = 920$кг/м^3

3. Автомашин замынхаа $\frac{1}{2}$-ыг 60км/ц хурдтай, үлдсэн хагасын хагасыг 15км/ц, үлдсэн хэсгийг 45км/ц хурдтай явбал дундаж хурд нь ямар байх вэ?

4. Зөв харгалзуул.

1. Нягт	a $\vartheta = \frac{S_б}{t_б}$	a . 1a2b3c4d5e
2. Дундаж хурд	b. $P = mg$	b. 1b2c3a4d5e
3. Шингэний жингийн даралт	c. $P = \rho gh$	c. 1e2b3d4a5a
4. Хүндийн хүч	d. $\rho = \frac{m}{V}$	d.1d2a3c4b5e
5. Архимедийн хүч	e. $F = \rho gV$	e.1d2c3b4e5a

5. Янз бүрийн хэлбэртэй савнуудыг зураг үзүүлжээ. Тэдгээрт ижилхэн h түвшинтэй байхаар ус хийсэн бол аль савны ёроол дахь шингэний даралт их байх вэ?



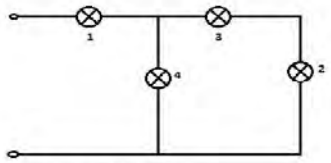
a. I савны b.II савны c. III савны
d. IV савны e. Бүх саванд ижил

6. Өндөр уулын оройд хоолны мах түүхийрдэг гэдэг үнэн болов уу? Яагаад?

7. 2м гүнд буй хүн дээрх даралт ямар байх вэ? Далайн усны нягт 1030кг/м^3

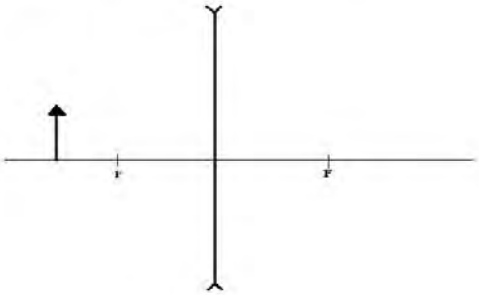
8. Тус бүр нь 12 Ом-ын 6ш эсэргүүцлийг зэрэгцээ холбох үед ерөнхий эсэргүүцэл нь ямар болох вэ?

9.



Зураг үзүүлсэн чийдэнгүүд ямар холболттой вэ?

10. Линзэнд дүрс байгуул.



Appendix 15Curriculum of Mechanical Engineering in New Mongol College of Technology

Механик Инженер
Ерөнхий суурь болон мэргэжлийн хичээл

Хичээлийн нэр				Хичээлийн код	Англи нэршил	Кредит	Курс тус бүрийн кредит тоо				
							1-р курс	2-р курс	3-р курс	4-р курс	5-р курс
Ерөнхий суурь хичээл	Үндсэн хичээл	Эх хэл	Монгол хэл		Mongolian language	3	1	1	1		
			Уран зохиол		Mongolian literature	3	1	1	1		
		Нийгэм	Инженерийн этик		Engineering ethic	2					2
			Дэлхийн түүх		World history	2	1	1			
			Монголын түүх		Mongolian history						
			Газар зүй		Geography	2	2				
			Нийгмийн тухай мэдлэг		Social science	2	1	1			
			Улс төр, эдийн засаг		Politics and Economics	2		1	1		
			Олон улсын харилцааны онол		International affairs	1				1	
		Математик	Алгебр		Algebra	4	4				
			Геометр		Geometry	3	3				
			Алгебр ба Геометр		Algebra and Geometry	3		3			
			Дифференциал ба Инте		Differentional and Integral Calculus	8		4	4		
		Байгалийн Шинжлэ	Физик		Physics	8	4	2	2		
			Хими		Chemistry	4	2	2			
			Биологи		Biology	2	2				
		Биеийн тамир	Биеийн тамир		Physical education	6	2	2	2		
			Эрүүл ахуй ба шинжлэх ухаан		Health and Science	4				2	2
		Соёл урлаг			Art	1		1			
		Гадаад хэл	Япон		Japanese	14	4	4	4		
										1	1
			Япон хэл зохион бичлэг		Japanese writing	6		2	2	1	1
			Япон хэл яриа		Japanese communication	4		1	1	1	1
			Англи хэл		English	8	2	2	2		
										1	1
			Англи хэл зохион бичлэг		English writing	5	1	1	1	1	1
			Англи хэл яриа		English communication	3	1	1	1		
		Сэтгэл зүй	Коммуникейшн үндэс		Communication lecture	2	1		1		
			Коммуникейшн дадал		Communication seminar	2	1		1		
		Бага нийлбэр				104	33	30	24	8	9
	Сонгох хичээл	Газар зүй судлал			Geography	2				2	
		Хууль зүй			Law	2				2	
		Эдийн засаг судлал			Economy	2				2	
		Философи			Philosopy	2				2	
		Түүх судлал			History	2				2	
		Математикийн тусгай онол			Mathematics special	2				2	
		Байгалийн шинжлэх ухааны онол			Natural science	2				2	
		Бага нийлбэр				14				14	
Тогтоосон кредитийн нийт тоо						118	33	30	24	22	9
Бүрдүүлэх кредитийн нийт тоо						106	33	30	24	10	9

		Тусгай ажиллагаа			3	1	1	1		
Мэргэжлийн хичээл	Үндсэн хичээл	Хэрэглээний физик 1		Applied Physics 1	2			2		
		Механикийн үндэс		Foundations of Machinery	1	1				
		Материал ба боловсруулалт		Materials and Processing	1	1				
		Мэдээлэл зүй		Information Literacy	1		1			
		Техникийн боловсруулах		Manufacturing Processes 1	2		2			
		Техникийн боловсруулах		Manufacturing Processes 2	1			1		
		Инженерийн механик		Engineering Mechanics	2			2		
		Материалын эсэргүүцэл		Strength of Materials I	2			2		
		Материал судлал 1		Materials Science I	1			1		
		Техник зургийн арга зүй		Machine Design 1	1			1		
		Машин механизмын деталь		Mechanism of Machine Elements	2			2		
		Програм хангамж 1		Information Engineering 1	1			1		
		Инженерийн ёс зүй		Engineering Ethics	1					1
		Механик зурагчлал 1		Machine Drawing 1	2	2				
		Механик зурагчлал 2		Machine Drawing 2	2		2			
		Механик зурагчлал 3		Machine Design and Drawing 3	2			2		
		Техникийн дадлага 1		Mechanical Practice 1	3	3				
		Техникийн дадлага 2		Mechanical Practice 2	3		3			
		Техникийн туршилт 1		Experiments in Mechanical Engineering I	3			3		
		Техникийн туршилт 2		Experiments in Mechanical Engineering II	4				4	
		Техникийн туршилт 3		Experiments in Mechanical Engineering III	2					2
		Төсөл зураг 1		Machine Design & Drawing I	2				2	
		Төсөл зураг 2		Machine Design & Drawing II	2				2	
		Төсөл зураг 3		Machine Design and Drawing III	2					2
		Төгсөлтийн ажил		Graduation Research	10					10
		Авах боломжтой кредит			55	7	8	17	8	15
	Сонгох хичээл	Заавал сонгох	Хэрэглээний математик 1A	Applied Mathematics IA	1				1	
			Хэрэглээний математик 1B	Applied Mathematics IB	1				1	
			Хэрэглээний математик 2A	Applied Mathematics IIA	1				1	
			Хэрэглээний физик 2	Applied Physics II	2				2	
		Механикийн математик		Mathematics for Mechanical Engineer	1					1
		Хэрэглээний математик		Applied Mathematics IIB	1					1
		Заавал сонгох	Материал судлал 2	Strength of Materials II	2				2	
			Материал	MaterialsScienceII	2				2	
			Техникийн зураг зүй 2	Machine Design II	2				2	
		Материал судлалын дадлага		Exercises in Strength of Materials	1					1
		Үрэлтийн тухай шинжлэх ухаан		Tribology	1					1
		Заавал сонгох	Термодинамик	Thermodynamics	2				2	
			Гидравлик	Hydraulic Mechanics	2				2	
		Термодинамик, гидравликийн дад лага		Exercise of Thermodynamics and Hydraulic Mechanics)	1					1
		Шингэний машин		Fluid Machinery	1					1
		Дулааны төхөөрөмж		Heat Engines	1					1
		Дулаан дамжуулалт		Heat Transfer	1					1
		Заавал сонгох	Мэдээлэл зүй	Information Engineering 2	1				1	
			Автомат удирдлага	Automatic Control	1				1	
			Механик судлал 1	Mechanical Dynamics I	1				1	
			Механик электроник 1	Mechatronics I	1				1	
		Механик судлал 2		Mechanical Dynamics II	1					1
		Механик электроник 2		MechatronicsII	1					1
		Хэмжил зүй		Instrumentation Engineering	1					1
		Төвшиний англи хэл 1		Technical English for Qualification I	1					1
		Төвшиний англи хэл 2		Technical English for Qualification II	1					1
		Бүс нутгийн ус, байгаль орчин судлалын дадлага		Field Research on Aquatic Environmental Engineering	1				1	
		Компьютерын онол		Introduction to Computer	1					1
		Цахилгаан ба электрон хэлхээ		Electrical and Electronic Circuits						1
		Биотехнологийн онол		General Biotechnology						1
		Нийгмийн систем		Infrastructure System						1
		Сургуулиас гадуурх		Factory Training	1				1	
		Бие даалт								
		Бага нийлбэр			35	0	0	0	21	17
Тогтоосон кредитийн нийт тоо					93	7	8	17	29	32
Авах боломжтой кредитийн нийт тоо					90	7	8	17	29	29

Appendix 16 List of Equipment in New Mongol College of Technology

Donation

Item Number	Apparatus	Remarks
D20140001	Let's note Panasonic Portable PC CF-W7	Donated by Prof Yamaguchi, Aino University
D20140002	Let's note Panasonic Portable PC CF-W7	Donated by Prof Yamaguchi, Aino University
D20140003	Let's note Panasonic Portable PC CF-W7	Donated by Prof Yamaguchi, Aino University
D20140004	Let's note Panasonic Portable PC CF-W7	Donated by Prof Yamaguchi, Aino University
D20140005	wacom Pen Tablet, PTH-451/K	Donated by Prof Yamaguchi, Aino University
D20160001	TOPCON Automatic Level AT-B2 Serial Number M98958	Donated by Chibasokki Corp.
D20160002	SOKKIA Automatic Level B20 Serial Number D10383	Donated by Chibasokki Corp.
D20160003	SOKKIA Electronic Theodolite DT510S/D20541, Serial Numer 136972	Donated by Chibasokki Corp.
D20160004	SOKKIA Electronic Theodolite DT510S/D20541, Serial Number 136979	Donated by Chibasokki Corp.
D20160005	TOPCON Automatic Level AT-B3, Serial Number QR2328	Donated by TOPCON CORPORATION
D20160006	TOPCON Automatic Level AT-B3, Serial Number QR2329	Donated by TOPCON CORPORATION
D20160007	TOPCON Degital Theodolite DT-214, Serial Number 156287	Donated by TOPCON CORPORATION
D20160008	TOPCON Degital Theodolite DT-214, Serial Number 156293	Donated by TOPCON CORPORATION

Rental

Item Number	Apparatus	Remarks
K20140001	WACOM Graohics Tablet PTK-450/K	Borrowed from Zetta Linx Inc.
D20160001	Mini Compression tools HAK112MA	Borrowed from LOBTEX CO., LTD.
D20160002	Mini Compression tools HAK113MA	Borrowed from LOBTEX CO., LTD.
D20160003	Wire Stripper, Single Wire 0.5mm/1.2mm 1.6mm/2.0mm	Borrowed from VESSEL CO.,INC.
D20160004	Wire Stripper, Single Wire 0.5mm/1.2mm 1.6mm/2.0mm	Borrowed from VESSEL CO.,INC.
D20160005	Wire Stripper, Stranded Wire 0.9mm2/1.25mm2 2.0mm2/3.5mm2/5.5mm2	Borrowed from VESSEL CO.,INC.
D20160006	Wall Inspection Hammer A-3, Serial Number 74104	Borrowed from Shinwa Rules Co., Ltd
D20160007	Wall Inspection Hammer A-3, Serial Number 74105	Borrowed from Shinwa Rules Co., Ltd
D20160008	Pick-up Magnet (Antenna Tyoe) JH613059	Borrowed from JOYFUL HONDA CO., LTD.
D20160009	Pick-up Magnet (Antenna Tyoe) JH613059	Borrowed from JOYFUL HONDA CO., LTD.
D20160010	Pick-up Magnet (Antenna Tyoe) JH613059	Borrowed from JOYFUL HONDA CO., LTD.
D20160011	Pick-up Magnet (Antenna Tyoe) JH613059	Borrowed from JOYFUL HONDA CO., LTD.
D20160012	Pick-up Magnet (Antenna Tyoe) JH613059	Borrowed from JOYFUL HONDA CO., LTD.
D20160013	LASER DISTANCE METER GLM50C Professional	Borrowed from Bosch Corporation
D20160014	LASER DISTANCE METER GLM50C Professional	Borrowed from Bosch Corporation
D20160015	BLACK+ DECKER EVO183P1 Body	Borrowed from Nippon Pop Rivets and Fasteners LTD.
D20160016	BLACK+ DECKER EVO183P2 Drill Head	Borrowed from Nippon Pop Rivets and Fasteners LTD.
D20160017	BLACK+ DECKER EVO183P Circular Saw Head	Borrowed from Nippon Pop Rivets and Fasteners LTD.
D20160018	BLACK+ DECKER EVO183P Impact Driver Head	Borrowed from Nippon Pop Rivets and Fasteners LTD.
D20160019	BLACK+ DECKER EVO183P Sander Head	Borrowed from Nippon Pop Rivets and Fasteners LTD.
D20160020	BLACK+ DECKER EVO183P Sander Adapter	Borrowed from Nippon Pop Rivets and Fasteners LTD.
D20160021	BLACK+ DECKER EVO183P Battery Charger	Borrowed from Nippon Pop Rivets and Fasteners LTD.
D20160022	BLACK+ DECKER EVO183P Battery Charger	Borrowed from Nippon Pop Rivets and Fasteners LTD.
D20160023	BLACK+ DECKER EVO183P Battery Charger	Borrowed from Nippon Pop Rivets and Fasteners LTD.
D20160024	BLACK+ DECKER EVO183P Jigsaw Haed	Borrowed from Nippon Pop Rivets and Fasteners LTD.
D20160025	BLACK+ DECKER EVO183P USB Adapter	Borrowed from Nippon Pop Rivets and Fasteners LTD.
D20170001	Micrometer, Serial Number 78935	Borrowed from Shinwa Rules Co., Ltd
D20170002	Micrometer, Serial Number 78936	Borrowed from Shinwa Rules Co., Ltd
D20170003	Dial Gauge, Serial Number 73750	Borrowed from Shinwa Rules Co., Ltd
D20170004	Protractor, Serial Number 62868	Borrowed from Shinwa Rules Co., Ltd
D20170005	Protractor, Serial Number 62868	Borrowed from Shinwa Rules Co., Ltd
D20170006	Die Set, Serial Number 22312	Borrowed from ICHINEN MITSUTOMO
D20170007	Digital Depth Gauge Mini 25mm	Borrowed from Shinwa Rules Co., Ltd
D20170008	Caliper 150mm	Borrowed from Shinwa Rules Co., Ltd
D20170009	Caliper 150mm	Borrowed from Shinwa Rules Co., Ltd
D20170010	M-Type Caliper 100mm	Borrowed from Shinwa Rules Co., Ltd
D20170011	M-Type Caliper 101mm	Borrowed from Shinwa Rules Co., Ltd
D20170012	M-Type Caliper 102mm	Borrowed from Shinwa Rules Co., Ltd
D20170013	Die Set, Serial Number 22312	Borrowed from ICHINEN MITSUTOMO
D20170014	Machinist Square 15cm	Borrowed from Shinwa Rules Co., Ltd
D20170015	Machinist Square 16cm	Borrowed from Shinwa Rules Co., Ltd
D20170016	Machinist Square 17cm	Borrowed from Shinwa Rules Co., Ltd
D20170017	Machinist Square 18cm	Borrowed from Shinwa Rules Co., Ltd
D20170018	Machinist Square 19cm	Borrowed from Shinwa Rules Co., Ltd
D20170019	Snips Straigh Tooth 240mm MS-2	Borrowed by Fujiwara Sangyo Co., Ltd.
D20170020	Snips Slender Tooth 210mm MS-3	Borrowed by Fujiwara Sangyo Co., Ltd.
D20170021	Snips Scooped-out 210mm MS-5	Borrowed by Fujiwara Sangyo Co., Ltd.
D20170022	Pin Punch 2.5mm	GREEN GROSS Co., LTD
D20170023	Pin Punch 3mm	GREEN GROSS Co., LTD
D20170024	Pin Punch 4mm	GREEN GROSS Co., LTD
D20170025	Pin punch 5mm	GREEN GROSS Co., LTD
D20170026	Pin Punch 6mm	GREEN GROSS Co., LTD

Appendix 17List of Cooperative Enterprises of New Mongol College of Technology

	Компанийн нэрс	Үйл ажиллагааны чиглэл	Хамтран ажиллах чиглэл
1	Эрэл груп	Барилга угсралт, барилгын материалын үйлдвэрлэл	Оюутнуудын дадлага, технологи солилцох
2	Хурд груп	Барилгын менежмент	Оюутнуудын дадлага, технологи солилцох
3	UFC груп	Барилгын менежмент, барилга угсралт	Оюутнуудын дадлага, технологи солилцох
4	Гангар холдинг ХХК	Барилга угсралт, барилгын материалын үйлдвэрлэл	Оюутнуудын дадлага, технологи солилцох
5	Делта констракшн ХХК	Барилга угсралт	Оюутнуудын дадлага, технологи солилцох
6	Делта эверест ХХК	Барилга угсралт	Оюутнуудын дадлага
7	Делта монолот ХХК	Барилга угсралт	Оюутнуудын дадлага
8	КЭНЗАИ ХХК	барилгын материалын үйлдвэрлэл	Оюутнуудын дадлага
9	Суруга Монгол ХХК	Барилга угсралт	Оюутнуудын дадлага
10	Таван богд констракшн	Барилга угсралт	Оюутнуудын дадлага, технологи солилцох
11	Номин констракшн	Барилга угсралт	Оюутнуудын дадлага, технологи солилцох
12	Бама-Пундам ХХК	Цахилгаан	Оюутнуудын дадлага
13	Барилга хөгжлийн төв	Сургалт , судалгаа	технологи, туршлага солилцох
14	Эрчимт зам сүлжээ ХХК	Барилгын менежмент	Оюутнуудын дадлага
15	Зам тээвэр хөгжлийн төв	Сургалт , судалгаа	технологи, туршлага солилцох
16	iERP Consulting LLC	Мэдээллийн технологи, програмчлал	Оюутнуудын дадлага, технологи солилцох
17	Susano Technology LLC	Мэдээллийн технологи, програмчлал	Оюутнуудын дадлага, технологи солилцох
18	Монполимет ХХК	Уул уурхай, Барилга угсралт,барилгын материалын үйлдвэрлэл, эмийн худалдаа	Оюутнуудын дадлага, технологи солилцох

Appendix 18Teachers' Evaluation Sheet in New Mongol College of Technology

		Level 1	Level 2	Level 3	Level 4	Level 5
1	Хичээл төлөвлөх чадвар	Сургалтын хөтөлбөрийн дагуу заах хичээлийн агуулгыг ном сурах бичгийн дагуу боловсруулах.	Заах буй хичээлийн хэрэглээ болон бусад хичээлийн уялдаа холбоог сайтар судлан заах.	Хичээлийн агуулгыг өөрийн туршлага болон туршилт дадлага ажлаар баяжуулан заах чадах.	Хичээлийн хөтөлбөр сургууль болон танхимийн зорилтод нийцэж байгаа асахийг дүгнэж судалгаа чадах.	Хичээлийн хөтөлбөрийг улс орны цаг үе, нийгэм эдийн засгийн нөхцөл байдалд олон улсын чиг хандлагад тулгуурлан шинэчлэх.
2	Заах арга зүйн чадвар	Самбар ашиглан лекц семинарыг ойлгомктой заах.	Проектор, самбарыг хослуулан ашиглан лекц семинарыг ойлгомктой заах.	Проектор, самбар, үзүүлэн ашиглан лекц семинар дадлага, туршилтын ажлыг ойлгомктой заах.	Active learning-н арга барил ашиглан хичээлийг системтэй явуулах.	Project based Learning, сюутны курсийн ажил, бие даасан судалгааны арга барилыг заах зөвлөх.
3	Хичээлийн зорилт биелэлтийг дүгнэх, үнэлэх чадвар	Хичээлийн зорилтыг онооктой тодорхойлох, Rubric үнэлгээ	Хичээлийн зорилтын дагуу шалгалтын материал бэлтгэх, сюутны зорилтыг биелүүлсэн эсэхэд үнэлэх дүгнэлт хийх чадах.	Сюутны зорилтоо дүгнэсэн байдалд дүн шинжилгээ хийж, зорилтоо хүрч чадвагүй шалтгааныг олж тодорхойлох.	Хичээлийн зорилт сургууль, танхимийн зорилтод нийцэж байгаа асахийг дүгнэж судалж чадах.	Хичээлийн зорилтыг эрэн-харж шинэчилж сайжруулах.
4	Гадаад хэлний мэдлэг чадвар	Өөрт хэрэгтэй мэдээллээ гадаад хэлээр хайж олох	Хичээлийн агуулгыг гадаад хэл дээрх материалаар баяжуулах.	Хичээлийн агуулгыг гадаад хэл дээрх материалаар баяжуулан сургалтын материал бэлтгэн орчуулан тараах.	Судалгааны ажил, эрдэм шинжилгээний өгүүлэгийг гадаад хэлээс орчуулах.	Судалгааны ажил, эрдэм шинжилгээний өгүүлэл англи, япон хэл дээр бичиж хэвлүүлэх.
5	Ёс зүйн чадвар	Багш нь бүх сургуулийн ажилтан гадрээрээ үрэлгэр бахархан, өөрийн эрх үүрэг, бариятлаг ёс зүйн хэм хэмжээг ойлгож мэдэж, бариятлаг чаддаг байх.	Багш нь өөрийн мэргэжлийн нэр хүндийг эрхэмлэн, эцэг эх асран хамгаалагчидтай хамтран ажиллаж чаддаг байх.	Багш нь оюутнуудад үлгэр дууриал болж чадахуйц идэвх чадвартай, чанч шударга, хичээл зүтгэлтэй, соёлч боловсон байх.	Сургуулийн дотор болон гадна өөрийнх нь үйлдэл бүр тус сургуулийн нэр хүнд, сургалтын чанартай үрэлгэр холбоотой болохыг ухамсарладаг байх.	Нийтийн эрх ашиг болон хувийн эрх ашигийг ялгаж салгаж, нийтийн эрх ашигийн төлөө ажиллаг чадах ухамсартай байх.
6	Оффисын ажлын чадвар	Төрөл бүрийн албан бичиг, e-mail, хурлын протоколыг зөв найруулгын алдаагүй бичиж, хөтөлж чадах.	Шалгалтын материалыг засан, дүнг нэгтгэн дүгнэж анализ хийх.	Хэрэглээний программуудыг хослуулан ашиглаж сургалтын материал, тараах материал бэлтгэх чадвар.	Мэрэгжлийн болон хэрэглээний программуудыг хослуулан ашиглаж, хичээл сургалтанд ашиглах.	Судалгаа шинжилгээний ажил, оюутнуудын судалгааны ур дүнг мэргэжлийн программ ашиглан боловсруулах.
7	Зөвлөн дадалшуулах чадвар (COACHING)	Даваж авсан болон хичээл заадаг англичаа оюутнуудын хичээлийн зорилтыг тодорхойлж өгч чадах.	Оюутануудад мэргэжлийнхээ чиглэлээ сонгон тодорхойлоход нь чиглэл өгөх, анхаарах хичээлүүдийг нь тодорхойлж өгөх, хичээлүүдийн уялдаа холбоог тайлбарлаж өгөх.	Оюутанүүдэд төгөлтийн төсөл сонгох болон ажил мэргэжлээ сонгоход нь залж чиглүүлэх.	Шинэ залуу багш нарын ажлын туршлага, мэргэжлийн чадварыг дээшлүүлэх зорилготой сургалт, хөтөлбөрийг зохион байгуулах.	Шинэ залуу багш нарт өөрийн туршлагаа заах зөвлөх, судалгаа шинжилгээний ажлын чиглэлийг тодорхойлох
8	Харилцааны чадвар	Харилцааны тал дээр ярих, бичих, болон зураагаар илэрхийлэх аргуудаас тохиромктойг нь сонгон өөрийгөө илэрхийлэх	Гадаадын болон дотоодын судлаачидтай чөлөөтэй харилцаа үүсгэх, сонаа бодлоо сонсон өөрийн үзэл бодлыг чөлөөтэй илэрхийлэх чадвар	Технологийн болон нийгмийн ухааны аль ч салбарынханд өөрийн мэргэшсэн зүйлсийг энгийн, оновчтой тайлбарлан ойлгуулах чаддаг байх.	Сургуулийн болон судалгааны үйл ажиллагаанд дэмжлэг үзүүлэх байгууллагын олон харилцаа тогтоон зорилго болон үйл ажиллагаа зөв, оновчтойгоор тайлбарлах, хамтын ажиллагаа өргөжүүлэх.	Бусдын ярисан, бичсэн болон зургаар илэрхийлсэн санаог ур дүнтэйг, хүнд хүрсэн эсэхийг үнэлж дүгнэх, шаардлагатай тохиолдолд тухайн зүйлд сайжруулалт хийх чаддаг байх
9	Сэтгэл санааны эрүүл мэндийг зохицуулах чадвар (MENTALHEALTH)	Стресс болон сэтгэл зүйн дарамтыг даван гарахын тулд хаяу үйлдэл гаргах, өөрт тулгарсан асуудлыг бусадтай зөвлөлдөх.	Даваж авсан анги болон хичээл ордог оюутнуудын хооронд-ноо харилцаа мадрэн, сайжруулах.	Өдөр тутмын оюутан хооронд-ын асуудлыг шийдвэрлэх	Оюутан болон хамтран ажиллагсад гарсан сэтгэл зүйн өөрчлөлт болон тулгарсан асуудалд мэдрэмжтэй хандаж арилжаж зөвлөлдөх.	Гадуурхагдсан, гэр бүлийн асуудалтай оюутанд сэтгэл зүйн зөвлөгөө өгөх
10	Манлайлах чадвар	Харилцан адилгүй чадвартай хүмүүс багаараа ур бүтээлтэй ажиллахад багын ахлагчийн гүйцэтгэх үүрэгийг ойлгож байх.	Аливээ зүйлсийг өөрийн бизэр үзэгдэлж хийх чадвартай, бусдын хийх ажлыг зөв удирдан чиглүүлэх, хамтран ажиллахад хүрэх чаддаг байх.	Байгууллагын зорилтыг тодорхойлж, зорилгоо хэрэгжүүлэхэд шаардлагатай ажлуудыг төлөвлөж, ажлын хэрэгжилтэнд хяналт тавих, сайжруулалт хийх, улмаар багын ажиллагааг ур дүнтэй болгох чадвар. Асуудлыг шийдвэрлэх чадвараа байнга хөгжүүлэх эрмэлзэлтэй байх	Аль ч салбар нэгжийн ажлын үялдаа холбоо, ур дүн болон тадгаарийн ахлагч нарын ажлын ур дүнг логитой үнэлэж дүгнэх чаддаг байх.	хүний нөөцийг зөв зохиостой хуваарилан, ажлыг хүчин чадварыг хамжин ур бүтээлтэй, хамжин сайнаар гаргаж чадах чадвар
11	Багийн ажиллагааны чадвар	Харилцан адилгүй чадвартай хүмүүс багаараа ур бүтээлтэй ажиллахад багаар ажиллахын ач холбогдолыг ойлгож өөрийн үүргийг ухамсарлах.	багын ажлын ач холбогдол, дүрэм, соёлыг ойлгон, багийн гишүүний хувьд бусдын үзэл бодлыг ойлгож, харилцааны соёлтойгоор хамтран ажиллах чадвар	Байгууллага болон багийн зорилт, ажил үүргийн хуваарилалтыг ойлгон, өөрийн санаачлагаар хуваарлагдсан ажил үүргийг давуулан биелүүлэх чадвар.	Аль ч салбар нэгжийн ажлын үялдаа холбоо, ажлын бүтээмж, ур дүнг логитой үнэлэж дүгнэх чаддаг байх.	Тесгийг хэрэгжүүлэхэд өөрийн хувь хүний нөөц боломжийг бүрэн даймлж ур дүнд хүргэх чадвар
12	Зохион байгуулах чадвар	Өдөр тутмын хувиарт ажил болон анги хамт олны ажил, эцэг эхийн хурал зэргийг зохион байгуулах	Сургуулийн багийн ажил болон, эдерлег арга хэмжээ, олон нийтийн ажлыг зохион байгуулах	Багш ажилчид болон мэргэжлийн салбарын сургалтын үйл ажиллагаа зохион байгуулах	Технологлын компани болон хамтран ажиллаж байгуулагуудтай хамтарсан үйл ажиллагаа зохион байгуулах	Гадаадын их дээд сургууль, боловсролын байгууллагатай хамтарсан төсөл хөтөлбөрийг хамтран зохион байгуулах
13	Эрсдлийн удирдлагын чадвар	Хичээл сургалт болон сургуулийн үйл ажиллагаанд үүсч гарч болзошгүй эрсдлийг олж илрүүлэх чадвартай байх.	Хэн ямар байдлаар эрсдэлд орж болох, болон хэн хэрхэн ямар эрсдэлтэй үйлдэл гаргаж болохыг урьдчилан харах чадвар	Эрсдэлийг үнэлж түүнээс сэрэмжлэх шаардлагатай арга хэмжээг авах.	Одоо байгаа эрсдэлээс сэрэмжлэх арга хэмжээ зохистой эсэх, талаар дүгнэх.	Гарч байсан эрсдэлтэй нөхцөл байдлийн талаар тэмдэглэл хөтлөн шинээр авах шаардлагатай арга хэмжээг боловсруулах гаргах.
14	Судалгааны онолын мэдлэг чадвар	Өөнө нь хийгдэж байгаагүй зүйлсийг онолын талаас нь үндэслэлтэйгээр авч үзэн нэмэл тестэй зүйлстэй харьцуулалт хийн тохиромктой хувилбарыг сонгох чадвар	Асуудлыг олж илрүүлэх түүнийг шийдэх онол, арга хэрэгслийг туршин, шийдлийг олж дэвшүүлэх. Мөн төвөгтэй юмс үзэгдлийн мөн чанарыг дүгнэж нэгтгэж системлэх.	Асуудлыг олж илрүүлэн шийдлийг олж, бодитой арга хэрэглүүрийг бодон олж чадах. Мөн төвөгтэй юмс үзэгдлийн мөн чанарыг дүгнэж нэгтгэж, системлэн үнэлж дүгнэх онол боловсруулах.	Төвөгтэй асуудлыг шийдэх шийдэл, түүнийг гүйцэдүүлэх арга хэрэгсэл нь ур дүнтэй байгаа эсэхийг үнэлж дүгнэх чадах	Нийтмэн болон ах үйлдвэрлэлийн салбарын төрөл бүрийн асуудлыг шийдэхийн тулд асуудлын шалгаанаг олж тогтоон зад задаа шийдэл гаргаж түүнийг гүйцэдүүлэх арга замыг төлөвлөх
15	Судалгааны ажил хийх, бүтээл гаргах, судалгааны хөрөнгө татах чадвар	Сургалтын хөтөлбөр, хичээлийн агуулгыг сайжруулахад чиглэсэн судалгаа хийх шинэ сургалтын материал ном товхимол гаргах.	Боловсролын болон инновацийн салбарын сүүлийн үеийн судалгаа, шинэ технологийг судлан өөрийн ажилд хэрэгжүүлэх талаар харьцуулсан судалгаа шинжилгээг хийх.	Дотоодын болон гадаадын сургалт судалгааны байгууллага технологийн компанитай хамтран ажиллаж шинэ арга барилшинэ технологи нэвтрүүлэх хамтарсан судалгаа шинжилгээ хийх.	Нийтийн болон ах үйлдвэрлэлийн салбарын тулгамдсан асуудлыг шийдэхэд нь хамтран ажиллаж, шинэ технологи, шинэ бүтээл дээр хамтран ажиллах.	Бие даасан судалгааны төсөл хөтөлбөрийг гадаадын болон дотоодын хөрөнгө оруулалтаар хэрэгжүүлэх

Appendix 19 Questionnaire for Protector

In January 2017, we addressed a questionnaire below to the parents whose children go to the existing three Kosen colleges in Mongolia and obtained answers back from 75 parents. The reader will find a summary of the results.

January 10, 2017

Your Opinion Appreciated

For further development and enhancement of Kosen education in MongoliaData, 'Collection Survey for Kosen in Mongolia', one of whose important parts are survey on existing three Kosen colleges, has been conducted by JICA, and under its commission, Asia SEED and KRI International Corp. Your kind cooperation will be much appreciated because we need opining from those whose children go to the Kosen colleges now in order to find current situation and what we should do for the further development of Kosen education in Mongolia. We would appreciated it very much if you could give us your detailed answers on the following questions. Please fill in the boxes below and send back by 16 January.

1. From which source did you get information about Kosen? (Please tick the number. Multiple answers acceptable.)

①Your Children's Junior High School ②Your Friends/Aquaintance ③Television ④Radio
⑤Internet ⑥Newspaper ⑦Others (_____)

2. About what did you worry choice of schools your child would be entering when he/her was a junior high school student?

3. Did you decide to send your child to Kosen on knowing of the educational system? If you wavered in the determination, would you let us know the reasons?

4. What is a key point of your decision that you had your child enter the Kosen college.

5. What do you think about the choice that you made your child enter the Kosen college?

The following are questions about your residential area and so on.

6.1 Residential Area : _____ City _____ District

6.2 Sex : ①Male ②Femail

6.3 Age : ① below 34 ② 35~39 ③ 40~44 ④ 45~49 ⑤ 50~54 歳 ⑥ above 55

6.4Your child Kosen college : ①IET Kosen ②MUST Kosen ③New Mongol Kosen

The personal information gathered through this questionnaire will be strictly protected. Thank you very much for your kind cooperation.

Results

- Resident Area

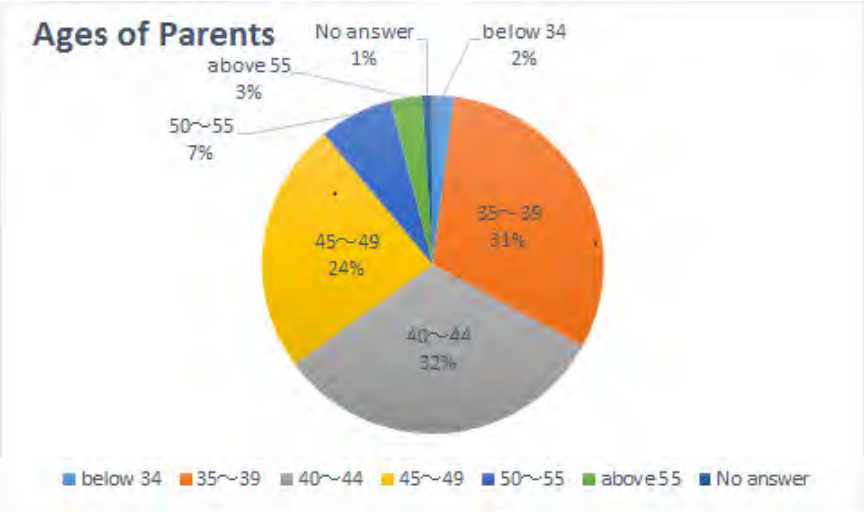
45 live in Ulaanbaatar. Only one lives in Khovd Province and another in Gobi-Sumber Province; from the other 28, we got no answers.

- Sex

23 (about 30 persent) are mail and 51 (about 70 percent) are female; one person gave no answer.

- Age

Two parents are below 34-year old, 23 parents are in 35～39, 18 parents in 45～49, five parents in 50～54, two parents above 55; only one gave no answer.



Ages of Parents who gave answers to the questionnaire

- Kosen colleges to which their child goes.

College of Technology, Institute of Engineering and Technology: 26, Institute of Technology, Mongolian University of Science and Technology: 23, New Mongol College of Technology: 26

- Sources from which the parents got information about Kosen

26 parents answer internet, 11 parents television: total number of parents who answer internet or mass media (television, newspapers and so on) is 35. Friends/acquaintances are answered by 31 parents. On the other hand, number of parents who answer junior high school is only six.

- About what did you worry choice of schools your child would be entering when he/her was a junior high school student?

11 parents answer that they had specific bothers and two answer that their children made the choice of Kosen by themselves. On the other side, 45 parents answer of having worried or had anxieties about school choices. The following are several examples of the worries or anxieties.

- It would take long time to complete children's education if they go to senior high school and then universities worrying about if they would become engineers successfully even if they study so long time.
- It would take long time for children to become engineers if they choose ordinal education system. That's quite terrible.
- What worried was that the parent had not vision of which department of university the children should go to after their graduation of senior high schools.

➢ Did you decide to send your child to Kosen on knowing of the educational system? If you wavered in the determination, would you let us know the reasons?

49 parents, i.e., more than 60 percent of the parents answer that they decided immediately. Among the answers that they hesitated in the choice, we find that lack of information about Kosen education caused the hesitation as a typical reason for the hesitation.

➢ What is a key point of your decision that you had your child enter the Kosen Technical College?

As typical answers, 14 parents' answers are that their children could learn engineering course earlier compare with other students who would enter senior high schools and then universities: seven parents answer that they would be given Japanese style education at Kosen.

➢ What do you think about the choice that you made your child enter the Kosen Technical College?

52 parents have positive feeling or opinions about their choices. The following are notable answers.

- Their children's sense of responsibility or autonomy has been developed (Answers about character building from 10 parents).
- Their children's abilities of time managements of self-control have been grown (from four parents).

However we find the minority voices as follows. (Each answer was given by one parent respectively.)

- Total system of the school including quality of education should be developed to level of Japanese Kosen colleges once Mongolia introduces Japanese type of Kosen education.
- Though expecting the children will become high level engineers, it is not sure that existing Kosen Technical Colleges are conducting education modelled after Japanese Kosen.
- The image of Kosen is different what the parent had. Educational environment is not in good condition. Shortage of teaching staff is serious.