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Утас 2: (+82)-1085192072

Misheel Institute for Young Researcher's NGO
32. Chinggis avenue, 24/1, Khan-Uul district, Ulaanbaatar
15160, Mongolia
E-mail address: misheelinstitute@gmail.com
Phone Number 1: (+976)-77858388
Phone Number 2: (+82)-1085192072

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[Research Articles]

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Research of Microbial Quality and Hygiene of Koumiss Koji (assets) of Mongolia

Bolormaa Chuluun-Otgon • Tserenkhand Zorigtbaatar •
Munguntsetseg Battur • Wuyundalai Bao



Research of microbial quality and hygiene of Koumiss koji (assets) of Mongolia

**Bolormaa Chuluun-Otgon^{1*}, Tserenkhand Zorigtbaatar²,
Munguntsetseg Battur³, Wuyundalai Bao⁴**

^{1*}College of Food Science, Northeast Agricultural University,
Harbin, P.R.China, 2976813175@qq.com

²School of Animal Science and Biotechnology, Mongolian University of Life Sciences,
Ulaanbaatar, Mongolia, tserenkhand.z@mul.s.edu.mn

³College of Food Science and Technology, Yunnan Agricultural University,
Kunming, P.R.China, m1a1220@yahoo.com

⁴College of Food Science and Engineering, Inner Mongolia Agricultural University,
Hohhot, P.R.China, wydl@imau.edu.cn

Abstract - The objective of this paper was to study the microbial quality characteristics and diversity of Koumiss koji (fermented dairy product from mare's milk) in four different regions of Mongolia, which provides data for a comprehensive understanding of the composition of acid Koumiss koji (assets) and lays a foundation for the development and utilization of strain resources in traditional fermented dairy products. Using High-throughput sequencing of the V3–V4 regions of the 16S rRNA gene, we determined the community composition of bacteria from 12 samples of Koumiss koji (assets) sampled from four different areas of Mongolia: Bulgan province, Arkhangai province, Uvurkhangai province, and Tuv province. Alpha diversity analysis showed that there were significant differences in the bacterial diversity of Koumiss koji (assets) from four different regions ($P < 0.05$). Bacterial diversity was most important in samples from the Tuv province, while species richness was highest in samples from the Bulgan province. Bacterial community composition analysis revealed 16 bacterial species in the 12 samples, of which Firmicutes and Proteobacteria were predominant in all four regions. There were 117 bacterial genera, of which Lactobacillus was predominant in all four regions. The results demonstrate that bacterial diversity in Koumiss koji (assets), the traditional starter cultures for Koumiss, from the four different regions of Mongolia, is related to geographical location.

Keywords - Koumiss koji (assets), Bacteria, Microbial diversity, High-throughput sequencing

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* Corresponding Author: Bolormaa Chuluun-Otgon

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1. INTRODUCTION

Koumiss, also known as sour mare's milk, tsegee, airag, Koumiss, etc., contains many probiotics, with lactic acid bacteria and yeast content being the most abundant, and is a healthy beverage [1]. In Mongolia, the fermentation and production of Koumiss have a history of hundreds of years. It is popular in Central Asia, Mongolia, Xinjiang, and Inner Mongolia due to its unique taste, therapeutic and health benefits, and high levels of nutrients [2]. The popular people of Mongolia like to drink mare's milk and Koumiss (fermented dairy products), but they rarely know their importance. Koumiss is rich in nutrients, such as vitamins, amino acids, proteins, lactose, minerals, etc., and a small amount of ethanol (alcohol), ultimately forming a healthy and delicious drink that can treat certain diseases. Koumiss is also very rich in unsaturated fatty acids, including oleic acid. Oleic acid prevents atherosclerosis, increases insulin release, reduces glucose release from the body, improves the immune system, and protects against some types of cancer [3].

Koumiss is usually brewed using traditional methods in summer and autumn. It is one of the most essential daily foods for Mongolian people in summer and a high-quality product with health care effects. Herds of horses are generally less susceptible to tuberculosis, brucellosis, and other livestock diseases, so mare's milk is relatively clean and pure [4].

Koumiss is very popular in Mongolia, and the provinces of Arkhangai, Uvurkhangai, Bulgan, Tuv, and Dundgobi are famous and rich in high-quality Koumiss. The composition of the microbiota in the Koumiss koji (assets) plays a crucial role in the quality of the final product. Fermented Koumiss for several years in a row, the Khukhuur (made from cowhide) has well absorbed the nutrients of the Koumiss; therefore, special funds are not required. The inheritors of the "Use of the Khukhuur fermentation Koumiss" are in the fermented provinces of Arkhangai, Bulgan, Uvurkhangai, Tuv, and Dundgobi. These regions' peoples use traditional fermentation methods, which have been recognized in the area and the region.

In this study, samples of Koumiss koji (assets) from four major koumiss-producing areas (Arkhangai province Khotont sum, Bulgan province Mogod sum, Uvurkhangai province Khujirt sum, Tuv province Batsumber) in Mongolia were collected, and high-throughput sequencing technology was used to determine the bacterial community composition and structure. These data are essential for further investigation of the microbial resources in Mongolia's traditional fermented dairy products and for the commercial production of Koumiss koji (assets).

The content of nutrients in Koumiss and microbial composition, acidity, and its medical effect directly depend on the design, cleanliness of fermentation vessel, fermentation time, fermentation temperature, storage container material, etc., [5].

2. THEORETICAL BACKGROUND

The pure culture and symbiotic microorganisms of Mongolian Koumiss koji (assets) are stored in the national gene bank and can be used when needed. People in Mongolian's Bulgan, Arkhangai, Uvurkhangai, Tuv, Dundgovi, and other province regions are accustomed to making Koumiss koji (assets) using traditional methods. Baldorj. R [6] isolated microorganisms from Koumiss koji (assets) in the above areas and mainly studied the diversity and physiological and

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biochemical characteristics of *Lactobacillus*, *Escherichia coli*, *Streptococcus*, alcohol-oxidizing lactose, fermenting and non-fermenting yeasts. Professor Baldorj. R pointed out in his research that the microorganisms of Koumiss koji (assets) comprise *L. Bulgaricus*, *L. Casei*, and *Lactococcus lactis subsp. Cremoris*, lactic acid bacteria, decomposed or undecomposed yeast, propionic acid, and acetic acid bacteria [7].

Mongolian scientists Indra. R and Baldorj. R [8] researched Koumiss's components, fermentation technology, microorganisms, and nutritional aspects. The results show that using natural resources as fermentation primers to make Koumiss koji (assets) is superior to the processing technology of pure culture and symbiotic microorganisms. This is related to many biotechnological factors, such as the buffer solvent of Koumiss and the microbial compatibility of Koumiss koji (assets) substance. This result provides an essential basis for individual producers and production companies of milk and dairy products to select raw materials of koji (assets) [9].

2.1 DEFINITIONS OF THE KOUMISS KOJI (ASSETS)

The use of starter cultures has long been a custom of Mongolians. The indigenous starter culture used to make traditional fermented dairy products is Koumiss koji (assets). Since ancient times, a conventional method for fermentation of Koumiss has been utilizing a khukhuur (made from cowhide), and next year a leather bag in which Koumiss from the previous year is dried. When fresh mare's milk becomes available in the next year, it is added to the made cowhide leather bag, and fermentation can proceed. Alternatively, freshly collected mare's milk is poured into a fermentation tank, and then an appropriate amount of Koumiss koji (assets) is introduced to it, and fermentation is allowed to proceed. Studies have shown that Koumiss koji (assets) contains a complex community of microorganisms that strongly influences the resulting koumiss's final microbial community and quality [10, 11].

Until today, there have been no reports on the microbial diversity of the Koumiss koji (assets) used in Koumiss production in different regions of Mongolia. As the main production area for koumiss, it is especially important to analyze the bacterial diversity of Koumiss koji (assets) from Mongolia. Traditional bacterial culture methods are slow and laborious, and it is easy to ignore the total biodiversity because some uncultured species are present in the sample. For this reason, the analysis of microbial diversity using traditional methods is often limited. In recent years, developing second-generation sequencing techniques, such as the Illumina platform, has provided a convenient way to analyze the microbial composition in various samples. The low cost of high-throughput sequencing means it is now possible to detect microorganisms that are difficult to culture and low in abundance [12].

2.2 OVERVIEW OF THE SURVEY RESEARCH ON MONGOLIAN KOUMISS KOJI (ASSETS)

For more than 100 years, from 1881 to 1981, many experts such as Bil (Биль), Sorokin (Сорокин), and Grigiriev (Григириев) et al. made contributions to the research. Finally, they concluded that the microorganisms of Koumiss, cow's milk fat-free fermented milk, and koji (assets) microorganisms of fermented milk drinks have common characteristics [13].

Tsion (Цион 1948), Bogdanova (Богданова 1962), Korolev (Королев 1966), Kvasnikov (Квасников 1975), and other experts and professors studied the structure and morphology of

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lactobacillus and colonies in Mongolian traditional Koumiss koji by physiological and biochemical analysis. Judging from the research conclusions of these multiple scholars, they identified one of the dominant strains as *Lactobacillus bulgaricus Mon-75* [14].

Since 2009, Mongolian scientists have been collaborating with Chinese and Russian scientists to identify further the DNA structure of the lactic acid bacteria in Koumiss koji and determine the characteristics of the microorganisms and probiotics. In 2009, Z. H. Sun and W. J. Liu collected samples of dairy products, yogurt, and Koumiss made by herders using traditional methods in my country's Ulaanbaatar city, Uvurkhangai, Govi-Altai province, and other regions, the dominant strains of lactic acid bacteria contained in them were determined. Research results show that the dominant strains in Koumiss koji are *Lactobacillus helveticus*, and the dominant strains in Koumiss are *Lactobacillus helveticus* and *Lactobacillus fermentum* [15].

3. MATERIALS OF METHODS

3.1 THE KOUMISS KOJI (ASSETS) SAMPLES AND MAIN CULTURE MEDIUM

They were collected from 12 herders' houses, including Arkhangai province Khotont sum, Bulgan province Mogod sum, Uvurkhangai province Khujirt sum, and Tuv province Batsumber sum in Mongolia. Koumiss koji (assets) fermented using the traditional method is a basis for Koumiss. It was transported to the School of Food Science and Engineering Laboratory, Inner Mongolia Agricultural University, through cryogenic preservation for analysis and research. The collection, sample codes, and grouping of samples of Koumiss koji (assets) are shown in Table 1.

Table 1. Sample code and grouping of Koumiss Koji

Sampling provinces name	Sample code	Group name
Bulgan province	BEG, BEG1, BEG2	B group
Arkhangai province	HHA, HHA1, HHA2	H group
Uvurkhangai province	QHA, QHA1, QHA2	Q group
Tuv province	ZY, ZY1, ZY2	Z group

Also, nutrient medium MRS agar and MRS broth, Skim milk medium, YPD (YEPA) agar and YPD (YEPA) broth, Bengal red medium extract, bacteriological peptone, glucose, and agar were used.

3.2 MICROBIOLOGICAL LIMITS OF MONGOLIAN KOUMISS KOJI (ASSETS)

According to the detection method of "Fermented Milk" (GB 19302-2010), the coliform bacteria (*Escherichia coli*), *Staphylococcus aureus*, *Salmonella*, Yeast, mold (Mucedine), and other microbial limits. The "Fermented Milk" (GB 19302-2010) uses the method to limit the quantity of Microorganism of Koumiss koji (assets), as shown in Table 2.

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Table 2. Limit the quantity of Microorganism

Project	Sampling scheme ^a and limit (if not specified, expressed in CFU/g or CFU/mL)				Inspection method
	n	C	m	M	
<i>Escherichia coli</i>	5	2	1	5	GB 4789.3 Plate counting method
<i>Staphylococcus aureus</i>	5	0	0/25g (mL)	—	GB 4789.10 Qualitative test
<i>Salmonella</i>	5	0	0/25g (mL)	—	GB 4789.4
Yeast ≤			100		GB 4789.15
Mucedine ≤			30		

Note: The analysis and processing of ^a sample shall be carried out following GB 4789.1 and GB 4789.18. "—" means it cannot be detected.

The number of lactic acid bacteria in Koumiss koji (assets) samples collected from different regions was determined according to the Lactobacillus Test of Food Microbiology (GB 4789.35-2016). The Quantity of Lactic Acid Bacteria of Koumiss koji (assets) uses the identification method of Lactobacillus Test of Food Microbiology (GB 4789.35-2016) is shown in Table 3.

Table 3. Quantity of Lactic Acid Bacteria

Project	limit the quantity [CFU/g(mL)]	Inspection method
Lactic acid bacteria quantity ^a ≥	1×10 ⁶	GB 4789.35

Note: ^a there is no requirement for the count of lactic acid bacteria for products that have been heat-treated after souring.

3.3 STUDY ON THE MICROBIAL DIVERSITY IN MONGOLIAN KOUMISS KOJI (ASSETS)

3.3.1 EXTRACTION OF TOTAL DNA FROM KOUMISS KOJI (ASSETS)

Cell isolation and total DNA extraction: 2 mL of the Koumiss koji (assets) samples were taken and placed in a 50 mL centrifuge tube, denoted as tube 1. 10 mL phosphate buffer saline (PBS) was added to the line and oscillated for 5 min to form a bacterial suspension, and then centrifuged at 5000 r/min for 5 min. Transfer the supernatant to a new 50 mL centrifuge tube, tube 2. Add 10 mL PBS into tube 1, shake for 1 min, centrifuge for 5000 r/min, and then transfer the supernatant into tube 2. Repeat the steps to add PBS to tube 1 until the supernatant transferred to tube 2 becomes clear; Centrifuge tube 2 (5000 r/min, 5 min) to take the precipitation, that is, the microbial flora in the Koumiss koji (assets). Fast DNA SPIN Kit extracted DNA for Soil. The extracted genomic DNA was detected by 1% agarose gel electrophoresis.

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3.3.2 PCR AMPLIFICATION AND SEQUENCING OF TARGET GENE

Take an appropriate amount of sample in a centrifuge tube and dilute the sample with sterile water to 1 ng/ μ L. Using the diluted genomic deoxyribonucleic acid as a template, the V3-V4 region of the 16S rRNA gene of bacteria and the ITS genome of fungi were amplified by PCR according to the selection of sequencing region.

The V3-V4 region of bacteria was amplified using a universal primer (338F/806R), whose name and sequence were:

338F	ACTCCTACGGGAGGCAGCAC
806R	GGACTACHVGGGTWTCTAAT

A primer (ITS1F/ITS1R) was used to amplify the fungal ITS sequence. The name and line of the primer were:

ITS1F	5'-CTTGGTCATTTAGAGGAAGTAA-3'
ITS1R	5'-GCTGCGTTCT-TCATCGATGC-3'

PCR amplification conditions: pre-denaturation at 98°C for 3 minutes, denaturation at 98°C for 45 seconds, annealing at 53°C for 30 seconds, extension at 72°C for 45 seconds, 35 cycles of reaction at 72°C and extension for 8 minutes, and storage at -20°C.

3.3.3 DATA ANALYSIS AND CHART DRAWING

MiSeq sequencing obtains paired-end sequence data. First, the paired reads are spliced (merged) into one sequence based on the overlap relationship between PE reads. At the same time, the quality of the reads and the splicing effect are quality-controlled and filtered. Based on the start and end of the sequence, The end barcode and primer sequences are used to distinguish samples to obtain adequate arrangements, and the sequence direction is corrected to obtain optimized data. Clustering operations divide lines into many groups according to their similarities. One group is an OUTs. All arrangements are divided into OTUs according to different similarity levels. Usually, biological information is performed on OTUs at the 97% similarity level. Scientific, statistical analysis, using the Rank-Abundance curve to indicate species abundance and species evenness, using the RDP classifier Bayesian algorithm to perform taxonomic analysis on OTUs representative sequences with a 97% similarity level, and classifying them at each classification level (such as domain, boundary, phylum, class, order, family, genus, species, OTUs, etc.) to count the community composition of each sample. The MOTHUR was used to calculate the Alpha diversity index under different random models, and R language tools were used to make dilution curves and Venn diagrams. The curves were constructed using each sample's microbial Alpha diversity index at different sequencing depths. This reflects the microbial diversity of each instance at different sequencing quantities and counts the number of standard and unique species in multiple groups or samples. QIIME calculated the Beta diversity distance matrix for hierarchical clustering analysis, used the UPGMA algorithm to construct a tree structure, and used the Kruskal-Wallis rank sum test to analyze significant differences between groups.

4. RESULT AND ANALYSIS

4.1 MICROBIOLOGICAL LIMITS OF MONGOLIAN KOUMISS KOJI (ASSETS)

The limits of microorganisms such as *Escherichia coli*, *Staphylococcus aureus*, *Salmonella*, Yeast, and Mucedine are determined according to the detection method of "Fermented Milk" (GB 19302-2010). The results of the Microorganism indexes of Koumiss Koji (assets) are shown in Table 4.

From Table 4, it can be seen that the number of viable yeasts in 12 samples of Koumiss koji (assets) distiller's yeast from four different regions ranged from $(5.6-6.5) \times 10^4$ to $(5.7-6.7) \times 10^6$ CFU/mL. This result is consistent with most reports agree.

Mu et al. [16] detected a viable yeast count of 10^5-10^7 CFU/mL in Koumiss. Ni Huijuan [17] found that the number of yeasts in traditional fermented dairy products in Xinjiang and Qinghai areas of China was 10^4-10^6 CFU/mL. However, no mold was detected in the samples of Koumiss koji (assets) from four different regions. The reason may be that the total acidity of Koumiss koji (assets) is high and unsuitable for mold growth and reproduction.

According to research reports, although the dominant bacterial groups in Koumiss are lactic acid bacteria and yeast, it should not be ignored that Koumiss also contains a small number of spoilage bacteria and harmful microorganisms, such as *Klebsiella pneumoniae*, *Salmonella* from chicken, *Escherichia hermannii*, *Escherichia coli*, *Shigella dysenteriae* [18]. Pollution of harmful bacteria may be related to climate, pasture and home environment, processing conditions, and human introduction. However, coliform and *Staphylococcus aureus* were not detected in the samples from four different regions.

Table 4. Microorganism indexes of Koumiss Koji

Project	Sample ID			
	B group	H group	Q group	Z group
<i>Escherichia coli</i> 0/25g (mL)	-	-	-	-
<i>Staphylococcus aureus</i> 0/25g (mL)	-	-	-	-
<i>Salmonella</i> 0/25g (mL)	-	-	-	-
Yeast (CFU/mL) ≤	$(5.7-6.7) \times 10^6$	$(5.6-6.5) \times 10^4$	$(5.7-7.1) \times 10^5$	$(5.3-6.7) \times 10^5$
Mucedine (CFU/mL) ≤	-	-	-	-

Note: "-" is not detected

According to the "Food Microbiology Test - Lactic Acid Bacteria Test" (GB 4789.35-2016), the lactic acid bacteria quantity of Koumiss koji (assets) samples from different regions was determined. The results of the Lactic Acid Bacteria quantity of Koumiss Koji (assets) are shown in Table 5.

It can be seen from Table 5 that the quantity of viable lactic acid bacteria in 12 samples of Koumiss koji (assets) from four different sampling points ranged from $(2.9-5.6) \times 10^6$ to $(1.5-2.6) \times 10^7$ CFU/mL. This result is consistent with most reports. Watanabe et al. [19] studied traditional fermented Koumiss and found that the quantity of viable lactic acid bacteria and yeast in Koumiss was about 10^7 CFU/mL. Ishii et al. [20] determined the microorganisms of Koumiss in three areas of nomadic nationality in

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Mongolia, and the count of lactic acid bacteria ranged from 1.26×10^7 CFU/mL to 7.94×10^8 CFU/mL. Although Koumiss inhibits harmful bacteria at a particular fermentation stage and reaches a specific pH value, some probiotics in Koumiss can also inhibit harmful bacteria. Still, the count of lactic acid bacteria is about one logarithm higher than that of yeast. The composition of microorganisms in Koumiss is affected by various factors such as region, natural environment, herdsman's families, production methods, seasons, fermentation periods, etc.

Table 5. Lactic Acid Bacteria quantity of Koumiss Koji (assets)

Sample ID	B group	H group	Q group	Z group
Quantity of lactic acid bacteria (CFU/mL)	$(1.5-2.6) \times 10^7$	$(2.9-5.6) \times 10^6$	$(8.8-9.7) \times 10^6$	$(9.6-9.9) \times 10^6$

4.2 STUDY ON THE MICROBIAL DIVERSITY IN MONGOLIAN KOUMISS KOJI (ASSETS)

4.2.1 SEQUENCING OF 16S rRNA V3-V4 REGION OF BACTERIA IN KOUMISS KOJI (ASSETS)

By using high-throughput sequencing technology, the 16S rRNA V3-V4 regions of bacteria in 12 samples of Koumiss koji (assets) prepared by traditional methods collected from Bulgan province Mogod sum, Arkhangai province Khotont sum, Uvurkhangai province Khujirt sum, and Tuv province Batsumber sum in Mongolia were sequenced as shown in Figure 1.

As can be seen from Figure 1, a total of 465 OTUs were obtained from 12 samples of Koumiss koji (assets) from four different regions and 154 OTUs were obtained from the B group, H group contains 99 OTUs, Q group 99 OTUs, Z group has 113 OTUs.

The OTUs number of group B bacteria was the highest, indicating the most abundant species. In contrast, the OTUs number of group Z bacteria was relatively low, indicating the rather large bacteria species. The remaining OTUs of group H and group Q were the same at 99, indicating little difference in richness and high uniformity in this region.

The number of optimized sequences obtained from 12 samples from four different regions was 577699, and the average length was 447bp. All arrangements were classified into OTUs with 97% similarity and were copolymerized into 135 OTUs, totaling 465 OTUs. The results were as follows: 1 domain, 1 kingdom, 16 phyla, 31 classes, 56 orders, 74 families, 98 genera, 117 species.

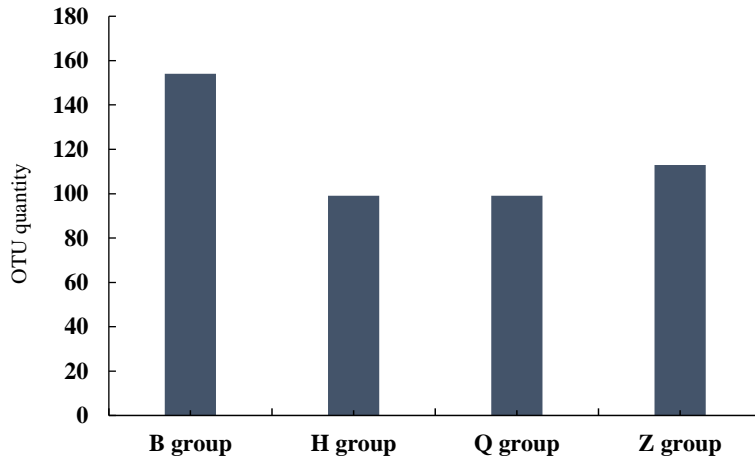


Fig. 1 Quantity and Distribution of OTUs in Bacterium

4.2.2 ABUNDANCE ANALYSIS OF BACTERIA IN KOUMISS KOJI (ASSETS)

The results of bacterial abundance analysis in 12 samples of Koumiss koji (assets) from four regions in Mongolia are shown in Figure 2. According to the abundance grade curve of bacteria in Figure 2, it can be seen that the sample curve span of groups Z, Q, and H is small. The curve's slope is significant, indicating that the abundance difference among OTUs is substantial, the uniformity is low, the bacterial composition is relatively simple, and the dominant strains are apparent. The curve span of the BEG1 region (indicating grade red curve) in group B is extensive, meaning that the abundance and uniformity among OTUs are high, and the dominant strains are not apparent.

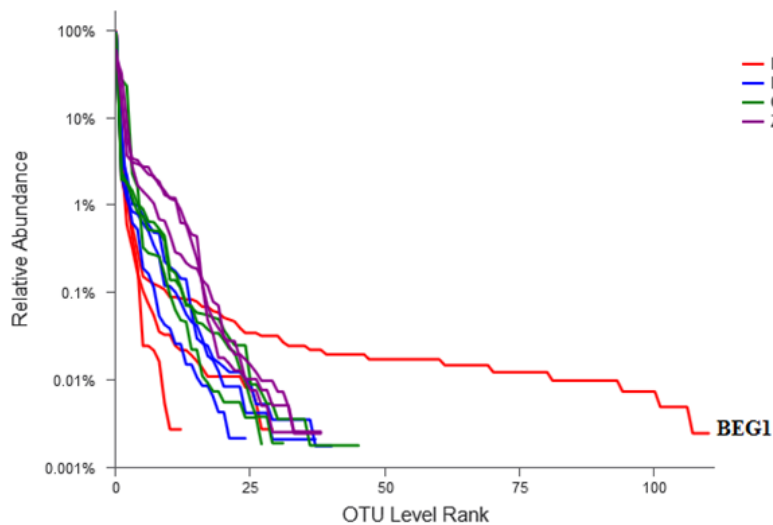


Fig. 2 Fungal Abundance Grade Curve of Koumiss Koji

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4.2.3 ANALYSIS OF ALPHA DIVERSITY OF THE BACTERIAL COMMUNITY IN KOUMISS KOJI (ASSETS)

The results of the Alpha diversity analysis of the bacterial community in Koumiss koji (assets) are shown in Table 6. As can be seen from Table 6, the Shannon value of bacteria in 12 samples from four different sampling points ranged from 0.271063 to 1.620478. The ACE index values ranged from 15.39158 to 111.801944. Chao index values range from 14.5 to 111.857143. Coverage values ranged from 0.99985 to 0.999982, and Simpson values ranged from 0.327756 to 0.90097, indicating rich bacterial species. Moreover, it can be seen from the Shannon curve in Figure 3 that the number of OTUs tended to flatten out when it reached 1000. This indicates that the sequencing depth can satisfy the samples' microbial diversity study.

Table 6. Diversity Analysis of Alpha Bacterium

Sample ID	Alpha diversity				
	Shannon index	ACE index	Chao index	Coverage	Simpson
B group	0.36±0.10 ^a	52.75±51.73 ^b	52.62±52.00 ^c	1.00±0.00 ^d	0.87±0.03 ^e
H group	0.49±0.09 ^a	39.96±10.80 ^b	37.56±9.22 ^c	1.00±0.00 ^d	0.82±0.03 ^e
Q group	0.81±0.43 ^a	39.44±14.18 ^b	37.73±12.95 ^c	1.00±0.00 ^d	0.65±0.28 ^e
Z group	1.56±0.08 ^a	42.86±0.41 ^b	42.83±3.33 ^c	1.00±0.00 ^d	0.36±0.02 ^e

Note: Average ±SD; Significant differences between letters (P<0.05).

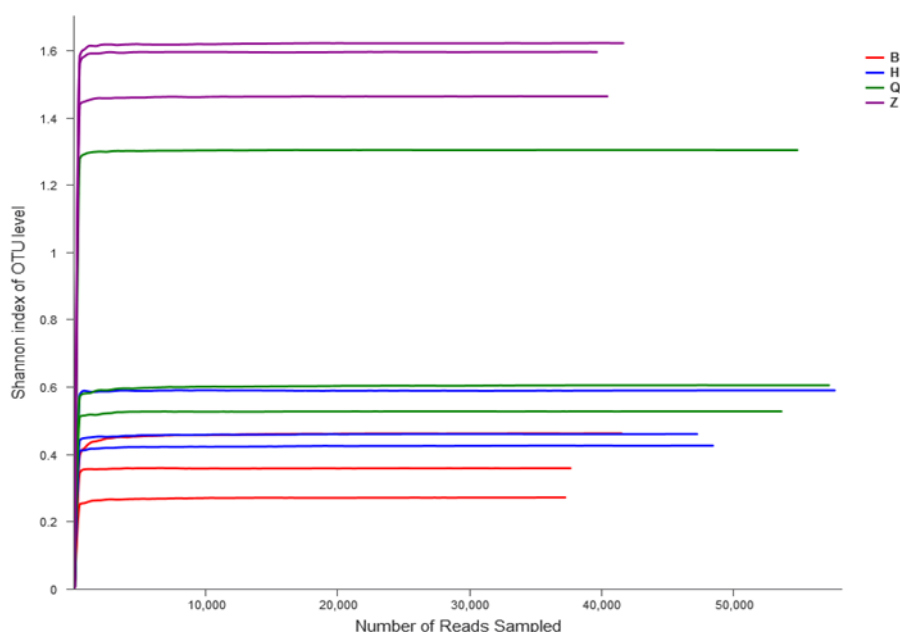


Fig. 3 Shannon dilution curve of Bacterium

4.2.4 ANALYSIS OF BACTERIAL COMMUNITY COMPOSITION KOUMISS KOJI (ASSETS)

Venn diagrams can count the number of standard and unique species in multiple groups or samples. They can more intuitively express the similarity and overlap of the species number composition of environmental samples. Different colors represent different groups, overlapping parts represent species common to multiple groups, non-overlapping parts represent species unique to that group, and numbers represent the number of corresponding species. The results of the Venn diagram analysis of the bacterial community composition in the Koumiss koji (assets) are shown in Figure 4. As can be seen from Figure 4, there are 3 OTUs unique to group Q, 2 OTUs unique to group H, 67 OTUs unique to group B, 1 OTUs unique to group Z, and 27 OTUs shared by the four regions.

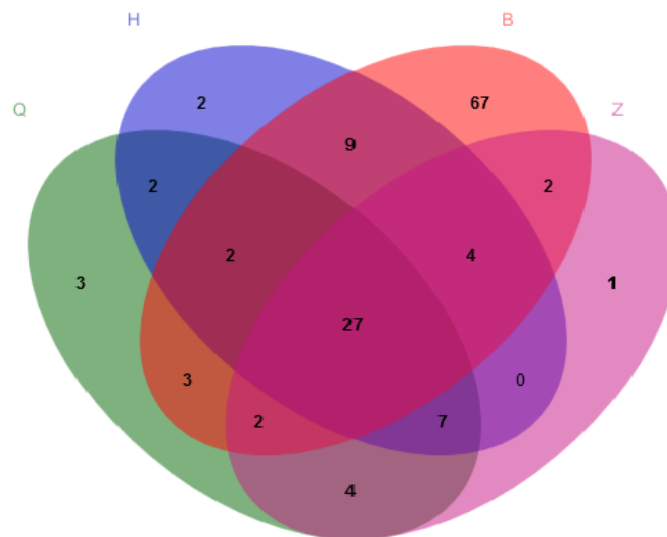


Fig. 4 OTUs sample distribution Venn of Bacterium

4.2.5 ANALYSIS OF BACTERIAL DIFFERENCES BETWEEN DIFFERENT REGIONS

The analysis results of the difference of bacteria at the genus level in the samples of Koumiss koji (assets) from different regions of Mongolia are shown in Figure 5. As can be seen from Figure 5, the significant difference test between groups uses strict statistical methods based on the obtained community abundance data to conduct hypothesis testing on species between different groups (or samples) of microbial communities to evaluate the significance of species abundance differences. Level to obtain significant differences between groups (or models).

Kruskal-Wallis rank sum test showed that the bacterial diversity of the from the four regions Koumiss koji (assets) samples was in *Lactobacillaceae*, *Streptococcaceae*, *Enterobacteriaceae*, and *Lactobacillaceae*. There was a significant difference between *Leuconostocaceae* and *Bifidobacteriaceae* ($0.01 < P \leq 0.05$).

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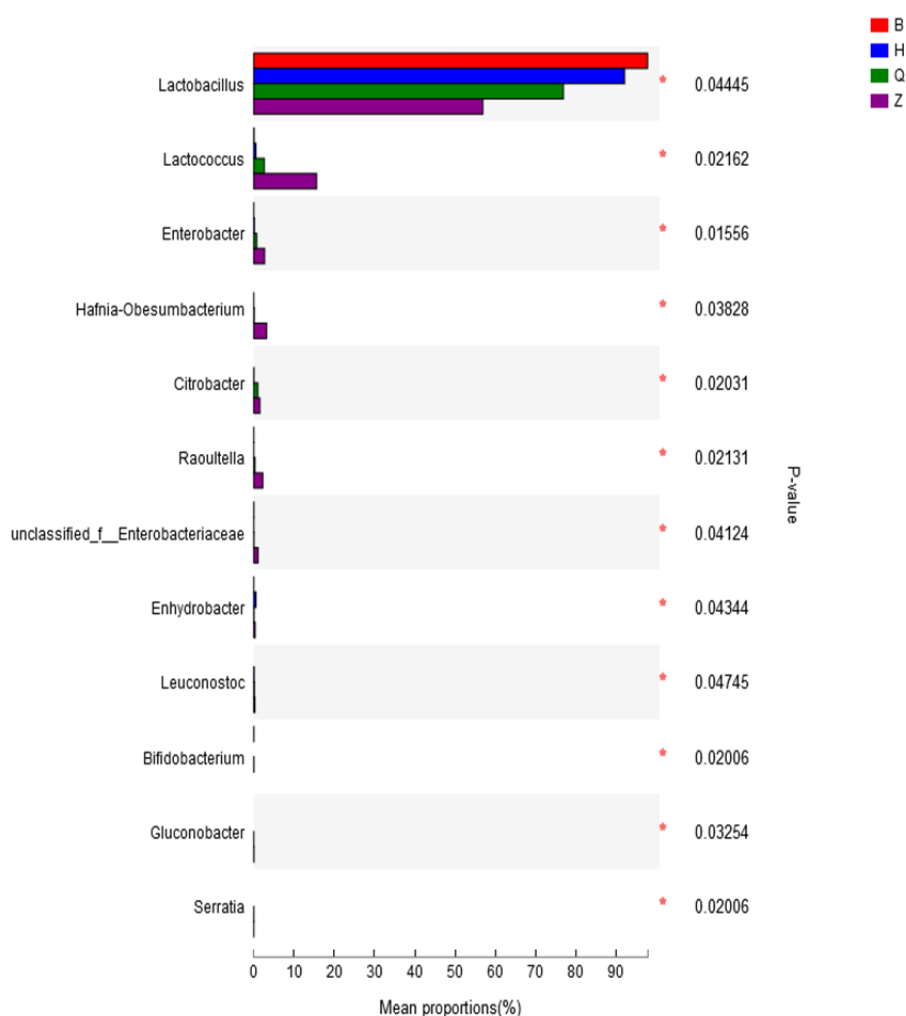


Fig. 5 Kruskal-Wallis Rank Sum Test at Classification Level of Bacteria Genus

Note: The vertical axis indicates the species name under a taxonomic level, the column length corresponding to the species tells the average relative abundance of the species in various groups, and different colors indicate different groups. The rightmost is the P value, * represents $0.01 < P \leq 0.05$.

4.2.6 SEQUENCING OF ITS REGION OF FUNGI IN KOUMISS KOJI (ASSETS)

The ITS region sequencing results of 12 samples of Koumiss koji (assets) are shown in Figure 6. As can be seen from Figure 6, a total of 278 OTUs were obtained from 12 samples of Koumiss koji (assets) from four regions, and there were 48 OTUs in group B, group H had 117 OTUs, and group Q had 81 OTUs, group Z had 32. The OTUs number of group H fungi was the highest, indicating the most abundant fungal species, while the OTUs number of group Z fungi was the lowest, indicating the relatively large fungal species. The number of OTUs in the remaining two groups was the most similar, with 48 and 81, respectively, indicating little difference in richness and high uniformity in this region. A total of 798,972 optimized sequences were obtained from 12 Koumiss koji (assets) samples from four different regions, with an average length of 275 bp. All arrangements were classified into 121 OTUs with 97% similarity, and the total OTUs was 278. The results were as follows: 1 domain, 1 kingdom, 5 phyla, 13 classes, 33 orders, 53 families, 73 genera, 88 species.

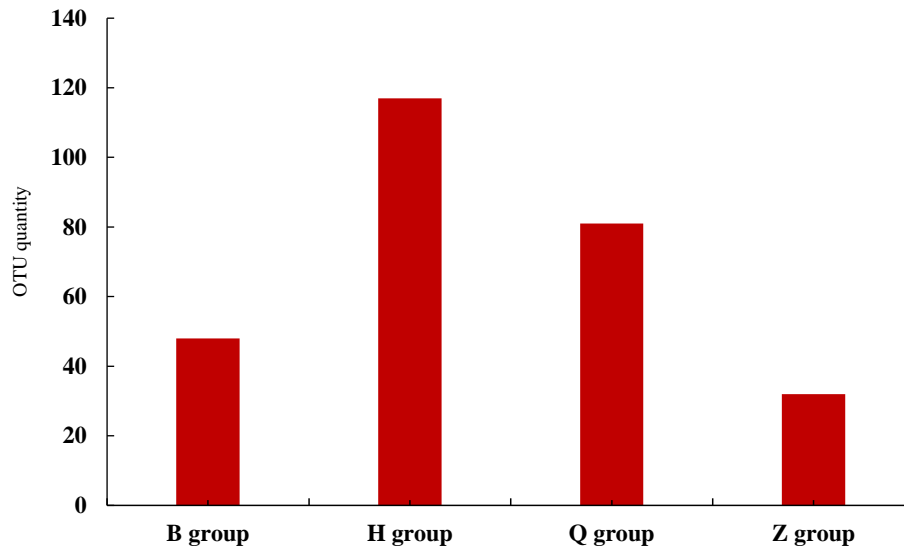


Fig. 6 Quantity and Distribution of OTUs in Fungal

4.2.7 ABUNDANCE ANALYSIS OF FUNGI IN KOUMISS KOJI (ASSETS)

The results of fungal abundance analysis in 12 samples of Koumiss koji (assets) from four regions of Mongolia are shown in Figure 7. According to the fungal abundance grade curve in Figure 7, it can be seen that the sample curves of group Z, group B, and group Q have a small span and almost steep decline, indicating that the abundance difference among OTUs is significant, the uniformity is low, the composition of bacteria is relatively simple, and the dominant strains are apparent, while the curve of HHA1 region of group H (indicating the grade curve blue) is wide and flat, and the decline is slow. The results showed that the abundance and uniformity of OTUs were high, and the dominant strains were not evident. The sample distribution of groups Z, B, and Q was concentrated, and 2 of the 3 samples in group H were clustered together, consistent with the overall OTUs sample distribution diagram.

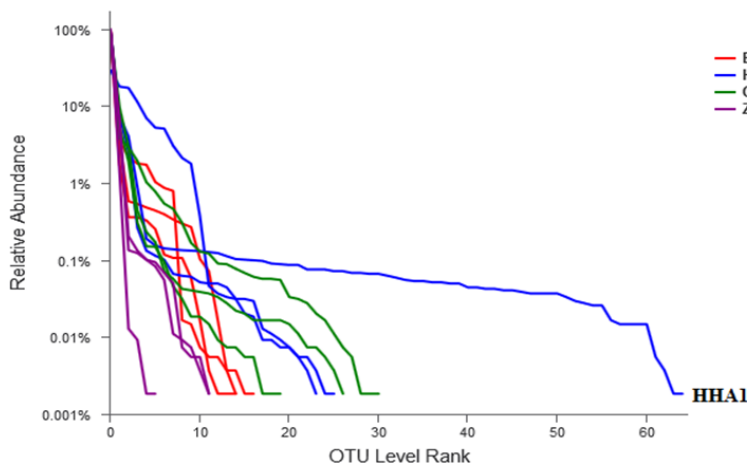


Fig. 7 Fungal Abundance Grade Curve of Koumiss Koji

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4.2.8 ANALYSIS OF ALPHA DIVERSITY OF THE FUNGAL COMMUNITY IN KOUMISS KOJI (ASSETS)

The results of the Alpha diversity analysis of the fungi community in Koumiss koji (assets) are shown in Table 7. As can be seen from Table 7, the Shannon value of fungi in 12 samples from four different sampling points ranged from 0.206857 to 2.002307. ACE index values ranged from 12 to 65.945381, The Chao index value from 12 to 65.5, Simpson values ranged from 0.170506 to 0.973886, and Coverage values of 0.999943 to 1 indicate abundant fungal species. From the Shannon curve in Figure 8, it can be seen that the number of OTUs tends to flatten out when it reaches 1000, which indicates that the depth of this sequencing can satisfy the study of microbial diversity in the sample.

Table 7. Diversity Analysis of Alpha Fungal

Sample ID	Alpha Diversity				
	Shannon index	ACE index	Chao index	Coverage	Simpson
B group	0.39±0.19 ^a	22.07±6.18 ^b	17.33±2.08 ^c	1.00±0.00 ^d	0.86±0.08 ^e
H group	1.09±0.81 ^a	40.17±22.36 ^b	40.00±22.12 ^c	1.00±0.00 ^d	0.56±0.34 ^e
Q group	0.53±0.14 ^a	28.77±5.94 ^b	28.28±6.42 ^c	1.00±0.00 ^d	0.79±0.05 ^e
Z group	0.21±0.12 ^a	17.30±8.40 ^b	12.67±1.15 ^c	1.00±0.00 ^d	0.91±0.06 ^e

Note: Average ±SD; Significant differences between letters (P<0.05).

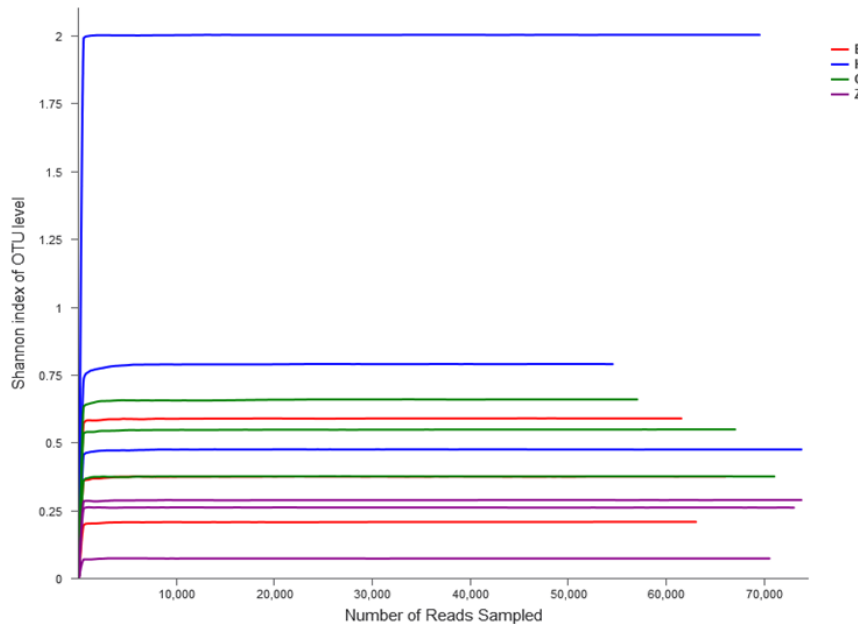


Fig. 8 Shannon dilution curve of Fungal

4.2.9 ANALYSIS OF COMMUNITY COMPOSITION OF THE FUNGI SAMPLES IN KOUMISS KOJI (ASSETS)

Venn diagram analysis results of community composition of fungi samples in Koumiss koji (assets) are shown in Figure 9. As can be seen from Figure 9, there are 22 unique OTUs in group Q, 46 unique OTUs in group H, 7 unique OTUs in both groups B, and 6 OTUs in group Z are common in the four regions, indicating that the strains in these four regions have low similarity and apparent differences.

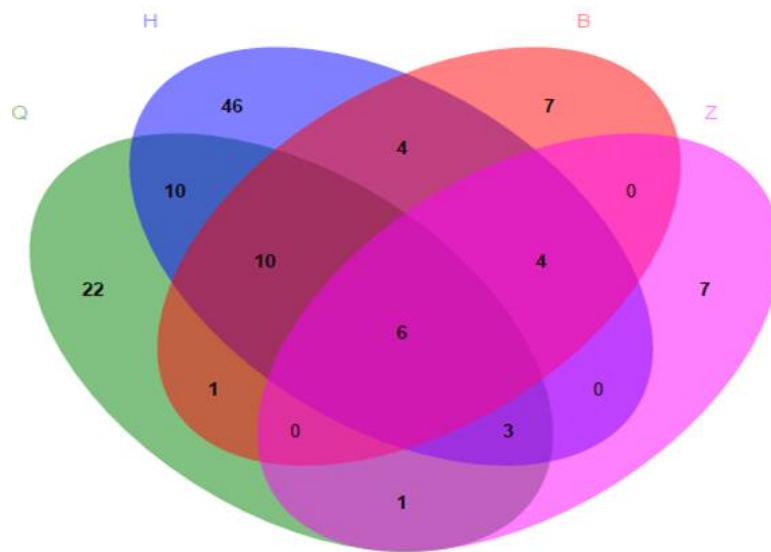


Fig. 9 OTUs sample distribution Venn of Fungal

4.2.10 ANALYSIS OF FUNGAL DIFFERENCES AMONG DIFFERENT REGIONS

The difference in the analysis results of fungi at the genus level in samples of Koumiss koji (assets) from different regions of Mongolia are shown in Figure 10. It can be seen from Figure 10 that at the genus classification level, the fungal diversity of the Koumiss koji samples from the four regions is in the genera *Kluyveromyces*, *Dekkera*, *Kazachstania*, and *Penicillium*. There is a significant difference in the genus *Penicillium* ($0.01 < P \leq 0.05$).

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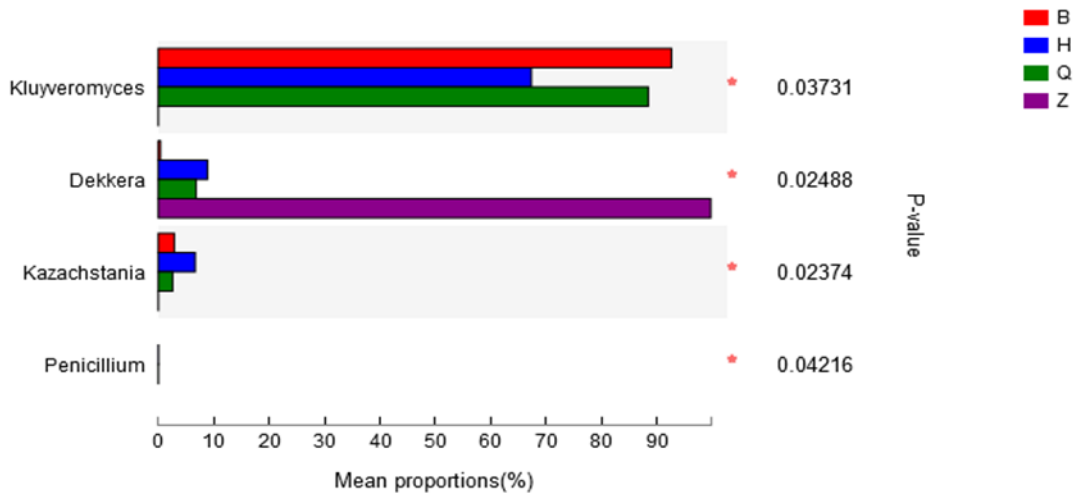


Fig. 10 Kruskal-Wallis Rank Sum Test at Classification Level of Fungus Genus

Note: The vertical axis indicates the species name under a taxonomic level, the column length corresponding to the species tells the average relative abundance of the species in various groups, and different colors indicate different groups. The rightmost is the P value, * represents $0.01 < P \leq 0.05$.

The difference in the analysis results of fungi at the family level in samples of Koumiss koji (assets) from different regions of Mongolia are shown in Figure 11. The results of the Kruskal-Wallis rank-sum test show that at the family classification level, the fungal diversity of the Koumiss koji (assets) samples from the four regions is significant in Saccharomycetaceae, Pichiaceae, and Trichocomaceae. There were substantial differences in Trichocomaceae ($0.01 < P \leq 0.05$).

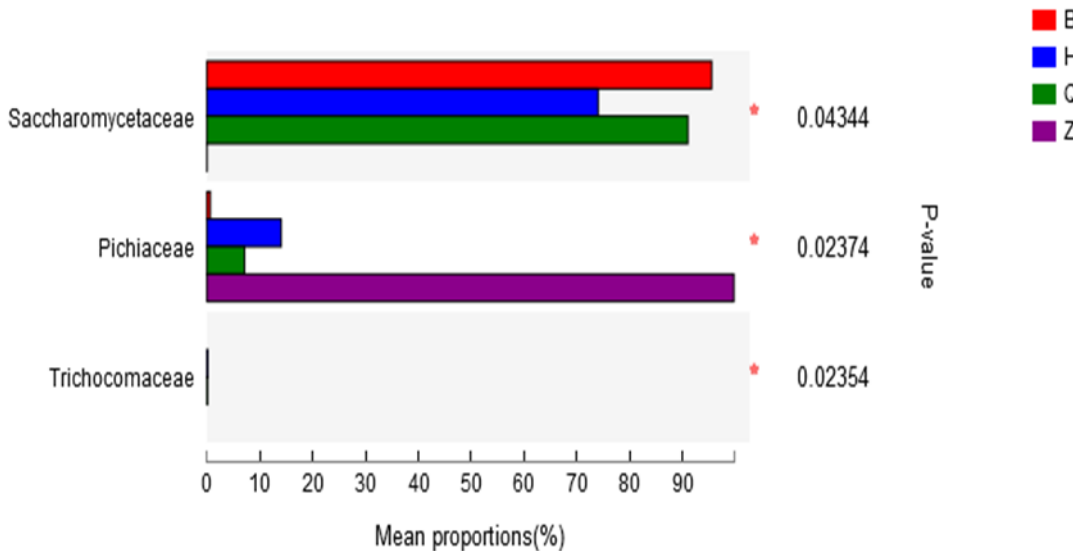


Fig. 11 Kruskal-Wallis Rank Sum Test at Family Classification Level of Fungal

Note: The vertical axis indicates the species name under a taxonomic level, the column length corresponding to the species tells the average relative abundance of the species in various groups, and different colors indicate different groups. The rightmost is the P value, * represents $0.01 < P \leq 0.05$.

5. CONCLUSION

Koumiss is a rich, nutritious, fermented dairy product with medical properties. The composition of the microbiota in the Koumiss koji (assets) plays a crucial role in the quality of the final product. The results demonstrate bacterial diversity in Koumiss koji (assets), the traditional starter cultures for Koumiss, from different regions of Mongolia, is related to geographical location. In summary, the Koumiss Koji (assets) in four different regions show microbial diversity, and this experiment has a clearer understanding of traditional fermented dairy products in Mongolia, which provides reference significance for future research.

Based on the study of microbial quantity and microbial diversity of traditional fermented Koumiss koji (assets) in four different regions of Mongolia, the main contents and results are as follows: The number of lactic acid bacteria in the samples of Koumiss koji (assets) from four different regions is that the number of lactic acid bacteria in the samples of group B is between $(1.5-2.6) \times 10^7$ CFU/mL; the number of lactic acid bacteria in the samples of group H is between $(2.9-5.6) \times 10^6$ CFU/mL; the number of lactic acid bacteria in the samples of group Q is between $(8.8-9.7) \times 10^6$ CFU/mL; the number of lactic acid bacteria in the samples of group Z is between $(9.6-9.9) \times 10^6$ CFU/mL;

The number of yeasts in the Koumiss koji (assets) samples from four different regions was between group B $(5.7-6.7) \times 10^6$ CFU/mL; group H $(5.6-6.5) \times 10^4$ CFU/mL; group Q $(5.7-7.1) \times 10^5$ CFU/mL; Z group $(5.3-6.7) \times 10^5$ CFU/mL. Generally speaking, the total number of lactic acid bacteria is higher than that of yeast.

The following conclusions were drawn using high-throughput sequencing technology data analysis: The number of optimized sequences obtained from 12 samples was 577699, with an average length of 447bp and a total of 465 OTUs. A total of 1 domain, 1 kingdom, 16 phyla, 31 classes, 56 orders, 74 families, 98 genera, and 117 species were detected. The number of optimized sequences obtained by fungi was 798972, with an average length of 275bp and 278 OTUs. Detected: 1 domain, 1 kingdom, 5 phyla, 13 classes, 33 orders, 53 families, 73 genera, and 88 species.

The research found that bacterial diversity differs in the four regions, and the microbial communities and compositions of the four areas differ. Among them, the abundance of group B is relatively high, and the bacterial diversity is high. The inter-group difference results showed that at the family classification level, the bacterial diversity of the Koumiss koji (assets) samples from the four regions was in the *Lactobacillaceae*, *Streptococcus*, *Enterobacteriaceae*, *Leuconostocaceae*, and *Bifidobacteriaceae* ($0.01 < P \leq 0.05$); The bacterial genera with high abundance in the samples were there is a significant difference between *Lactobacillus*, *Lactococcus*, *Enterobacter*, *Hafnia-Obesumbacterium*, *Raoultella*, *Citrobacter*, *unclassified for Enterobacteriaceae*, *Enhydrobacter*, *Leuconostoc*, *Bifidobacterium*, *Gluconobacter*, and *Serratia* ($0.01 < P \leq 0.05$).

Among the fungal diversity, the abundance of group H is higher, and the fungal diversity is good. The inter-group difference results of fungi showed that the fungal diversity of the Koumiss koji (assets) samples from the four regions at the family classification differences level were significantly higher in *Saccharomycetaceae*, *Pichiaceae*, and *Trichocomaceae* ($0.01 < P \leq 0.05$); The fungal diversity there is a significant difference in Koumiss koji (assets) samples from the four regions at the genus classification level in the genera *Kluyveromyces*, *Dekkera*, *Kazachstania*, and *Penicillium* ($0.01 < P \leq 0.05$).

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RESEARCH OF MICROBIAL QUALITY AND HYGIENE
OF KOUMISS KOJI (ASSETS) OF MONGOLIA

AUTHOR'S INTRODUCTION


1. First and Corresponding Author

	Bolormaa Chuluun-Otgon	2976813175@qq.com
	Doctor's student at the Cereal, oils and Vegetable Protein Engineering, College of Food Science, Northeast Agricultural University, Harbin, P.R.China	
Work field: Food science, Food Quality and Safety		


2. Co-Author

	Tserenkhand Zorigtbaatar	tserenkhand.z@mul.s.edu.mn
	Ph.D., Senior lecturer at the Department of Livestock Product & monitoring and Inspection, School of Animal Science & Biotechnology, the Mongolian University of Life Science, Ulaanbaatar, Mongolia	
Work field: Food safety, Food inspection and hygiene, Quality control of livestock product		

3. Co-Author

	Munguntsetseg Battur	m1a1220@yahoo.com
	Doctor's student at the Food Science and Nutrition Food, College of Food Science and Technology, Yunnan Agricultural University, Kunming, P.R.China	
Work field: Food science, Food Quality and Safety		

4. Co – Author

	Wuyundalai Bao	wycl@imau.edu.cn
	Ass. prof, Ph.D., Senior lecturer at the College of Food Science and Engineering, Inner Mongolia Agricultural University, Hohhot, P.R.China	
Work field: Food microorganisms and Biotechnology, Development, and utilization of probiotics		

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Critical success factors for ERP system implementation in Mongolia

Ulziibayar Jambaldorj • Shuree Batzangia • Bayasgalan Baasanjav •
Enkhtsetseg Ginjaatar



Critical success factors for ERP system implementation in Mongolia

Ulziibayar Jambaldorj^{1*}, Shuree Batzangia², Bayasgalan Baasanjav³, Enkhtsetseg Ginjaatar⁴

¹²³⁴Lecturer, Department of Accounting, University of Finance and Economics, Mongolia

¹Ulziibayar.j@ufe.edu.mn, ²shuree.b@ufe.edu.mn, ³bayasgalan.b@ufe.edu.mn,
⁴enkhtsetseg.g@ufe.edu.mn

Abstract- In the competitive business environment of the fourth industrial revolution and digital transition, the need to process qualitative information and use it for decision-making has become an important issue for company managers. Recently, many companies are considering this problem to be solved by implementing an integrated system /Enterprise Resource Planning-ERP/ that includes many functions such as finance, accounting, human resources, production, sales, distribution, ordering, purchasing, and customer management. In this research, we intended to determine the factors that influence the successful adoption of ERP systems, and rank those factors that influence the adoption of ERP systems based on the stakeholders' for the selected enterprises.

Keywords - Critical success factors, ERP Implementation, Stakeholder, Business process, Blueprinting

1. INTRODUCTION

Adopting an enterprise resource planning (ERP) system enables better management of resources and information flows. When properly implemented, the system streamlines data flow and provides employees with real-time access to operational data [1].

Organization can be more developed using modern information technology and perform more productive work at a lower cost [2].

The adoption of ERP systems has increased noticeably since the last three decades due to its efficiency and the growing need for an integrated enterprise system. However, the implementation of ERP systems poses challenges to organizations in terms of costs, process,

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* Corresponding Author: Ulziibayar Jambaldorj

planning, technology fit, and adoption. For example, there are difficulties in solving many problems such as process uncertainty, planning, and compatibility with technology [3].

ERP systems hold the promise of improving processes and decreasing costs. Furthermore, two important new frontiers for ERP are electronic business (e-business) and supply-chain management [4]. They can also reach beyond their own corporate walls to better connect with suppliers, distributors, and customers to engage in e-business [1].

ERP systems are the largest of any enterprise-wide projects. There is a one-time investment in the project and the software is expensive, but the consulting costs are even higher. For Meta Group, ERP implementation took about 23 months to figure out, with a total project cost of \$12 million [5]. From the business perspective, the need for Business Process Reengineering (BPR) to fit system functionalities or already embedded business processes, could be considered as the most important effect of implementing ERP solution [6].

Sometimes, most of the positions need to be re-planned according to the ERP system and change the business process. Therefore, the challenges and high failure rates of ERP system implementation continue to be widely reported in studies. A study pointed out that the probability of ERP failure ranged from 40 to 60 percent and another study still higher at 60 to 90 percent [7].

The studies show that the reasons for failure of implementing the ERP system were those: ERP Consultants recommendations were not followed, the IT department staff of the organization were inexperienced, many problems occurred during the implementation process due to understaffed, as well as the failure to successfully manage the communication between the project members, inadequate training for the project members, the failure to recruit in line with this mission, inadequate management support, inability to translate into the original language and insufficient knowledge of foreign languages have been identified. However, the close relationship and cooperation between the external consultants and the company's employees greatly influenced the successful implementation of such a project.

This study will contribute to the identification and evaluation of key success factors that reduce the probability of ERP system failure. It helps organizations to consider these factors during the ERP system implementation phases and use them effectively, so organizations can avoid ERP system failure. Our research purpose is to determine the factors that influence the successful adoption of ERP systems, and rank those factors that influence the adoption of ERP systems based on the stakeholders' survey of the selected enterprises. The following objectives were set in the research:

First. Determine a success factor indicator for ERP implementation

Second. Describe an evaluating method of success factor indicators

Third. Explain a success factor indicator by research data

Fourth. Rank a success factor indicator by research data and score

Fifth. Examine a hypothesis of this research comparing with research results and international studies

The following three assumptions were made.

Hypothesis I: If the organization has adopted the ISO9001 quality management system, it will have a positive effect on the successful implementation of the ERP system.

Hypothesis II: Organizational restructuring to fit the ERP system will have a positive effect on the successful adoption of the ERP system.

Hypothesis III: If blueprinting (Architecture choices) is done at the initial stage of the project, it will have a positive effect on the successful implementation of the ERP system.

2. LITERATURE REVIEW

Our literature review consists of two parts: introduction to ERP systems and implementation of ERP systems critical success factors.

2.1. INTRODUCTION TO ERP SYSTEM

An enterprise resource planning system (ERP) is a software package that integrates functional units such as production, finance, accounting, sales, distribution, and human resources in an organization and connects these processes to the supply chain [8].

ERP systems can significantly improve efficiency, productivity, service quality, reduce service costs, as well as make more effective decisions, improve information flow, generate financial information faster, support e-commerce, and assist in the development of new organizational strategies.

ERP began in the 1960s as material requirements planning (MRP) and later evolved into a more advanced system called MRP II. The latest ERP systems became more advanced and more productive when working with multiple business units: sales, operational planning, inventory/materials management, manufacturing, purchase, order processing, accounting, finance, human resources, customer relationship management and so on.

The basic architecture of an ERP system is a unified enterprise interface based on databases and applications. ERP systems have the following characteristics [9].

1. The ERP system is a software package designed for a client server environment supplies (traditional or web-based)
2. ERP systems integrate most of the business processes.
3. ERP systems process most of an organization's transactions.
4. ERP systems create and use extensive databases of the organization by storing information in the smallest units.
5. ERP system provides real-time access to data.

In some cases, ERP requires the integration of transaction processing and planning activities. These include: supporting multiple currencies, languages and multiple industries, etc. A successful ERP system can streamline processes within a company and improve overall

efficiency, while improving competitive performance externally, increasing customer responsiveness, and supporting strategic initiatives [1].

There are many factors to consider when deciding whether to implement an ERP system. The technical aspect is not the only factor required. Unfortunately, many companies realize that too late. The financial commitment is huge, so CEOs and senior executives must be deeply involved. Simply put, ERP is not for every business. Develop a business case and formally evaluate the benefits to the individual as well as the company's competitors to inform the decision to invest in an ERP system. The analysis needs to consider not only specific cost/benefit analysis but also non-financial factors. Non-financial benefits include information transparency and flexibility. [10].

Information technology maturity, computer education, business size, business process-reengineering experience, and management commitment are identified as organization-level factors in the study, and didn't categorize factors as success factors and failure factors [11].

ERP system implementation costs fall into three areas: software, hardware, and employees. Employees (HR) costs are the largest and most expensive, but the least attention-grabbing part. Software and hardware costs can often be easily calculated. But the cost of "human capital" is not. Articles on the factors influencing the adoption of ERP systems continue to propose a conceptual model to examine the influence of top management in an organization.

2.2 SUCCESS FACTORS

Implementing ERP system is always challenging and requires consideration of various risks for its successful implementation. Researchers continue to conclude that focusing on the evaluation of Critical Success Factors (CSFs) of ERP implementations is critical to project success. Therefore, by summarizing the results of 15 studies, identifying, and analyzing the CSF, the indicators shown in Table 1 were determined. Based on the results of the study, the CSFs affecting the implementation of the ERP system were identified in five categories as follows: 1. Factors related to organization: 2. Factors related to technology: 3. Factors related to project: 4. Factors related to individuals: Factors related to operation: Also, indicators to measure each general category are defined.

Each researcher defines the success factors that influence the introduction of ERP systems differently depending on the object they are studying. We identified the following success factors from the study of [12 ~14] and classified them according to their relevance.

Table 1. Study of success factors that affect ERP system implementation

Success factors affect the implementation of ERP system	Literature review
<p>Factors related to organization:</p> <ul style="list-style-type: none"> Top Management support and responsibilities: Financial and other support, involvement and knowledge Clarity of vision, goals and objectives Change management: Systematic management activities aimed at changing the current state of the organization by directing future goals and strategies in accordance with changing environmental conditions. Communication between departments/offices/places Uncertain conditions that may arise during the project and its implementation Resources for projects Organizational Culture/Culture Change Cooperation between departments/offices/places Business plan and long-term vision Official project plan/schedule Organizational compatibility with ERP systems Experienced Project Manager-Leader Sufficient resources Performance monitoring and evaluation Motivational factors for ERP system adoption Effectiveness of Management to Reduce Customer Resistance 	<p>(Ram & Corkindale, 2014) (M & Cuenca, 2013)</p>
<p>Factors related to technology:</p> <ul style="list-style-type: none"> Suitability of legacy information systems Data analysis and conversion Data and data quality Opportunity for the IT department Technical issues 	<p>(Ram & Corkindale, 2014)</p>
<p>Factors related to project:</p> <ul style="list-style-type: none"> Training for every user Project Management: Specific management activities to plan, manage, lead, motivate and control the human resource and other resources implement the project ERP project leader Business process redesign and process management Communication between ERP project team members Appropriateness of ERP system selection ERP project team skills ERP project team structure Compatibility with system settings Board: A board made up of individuals and organizations that provides strategic level guidance on the project Cooperation Implementing strategies Defined architecture Integration of ERP plan with business plan User project formal methods and methodology 	<p>(Ram & Corkindale, 2014)</p>
<p>Factors related to individuals:</p> <ul style="list-style-type: none"> User engagement Ease of use of the system and user acceptance Support from all employees 	<p>(Ram & Corkindale, 2014)</p>

<p>Factors related to operation: ERP system supplier capacity utilization Ongoing ERP supplier support Cognition of new business processes Expectation management: the motivation of human action considering the relationship of: labor expenditure-result, result-incentive, incentive-inspiration Use of tools developed by the supplier Supplier/customer partnerships Empowered decision makers Scope Management: Activities responsible for meeting project goals and objectives through project conceptualization, planning, execution, and completion processes. Leading consultants Stakeholder trust</p>	<p>(Ram & Corkindale, 2014)</p>
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3. RESEARCH

3.1. RESEARCH METHODOLOGY

This survey was obtained by questionnaire method. The questionnaire consisted of a total of 158 questions in 2 parts (general and special) for 6 types of employees/departments: ERP project team, TOP management, Administration and HR, IT department/office, Business process specialist, and other employees. Table 2 shows the number of questions were asked by each participants.

Table 2. Number of questions for each participant

Question type	ERP project team	TOP management	Administration and HR	IT department/team/office	Business process specialists	Other employees	Total
Part I. General questions	5	5	5	5	5	5	30
Part II.	27	33	17	19	18	14	128
-About ERP system	2	3					5
-Success factors	25	30	17	19	18	14	123
Total	32	38	22	24	23	19	158

The general questions are the same for each participant, and the special questions are different. In the part of special questions, are the following factors important for ERP system implementation? there were 51 questions and 5 answers (1. Totally disagree, 2. Disagree, 3. Don't know, 4. Agree, 5. Strongly agree).

3.2 METHOD OF DATA COLLECTION

Employees of 9 companies that have successfully introduced ERP systems were included in the survey, and questionnaires were collected using Google form. The data was collected for 50 days from March to April 2023.

4. RESEARCH RESULTS

A total of 78 respondents of 9 companies participated in the survey. The participant is shown by the industry and position. Figure 1 shows a operation sectors of entities that have implemented ERP systems and Figure 2 shows an information of position of employees who participated in the study.

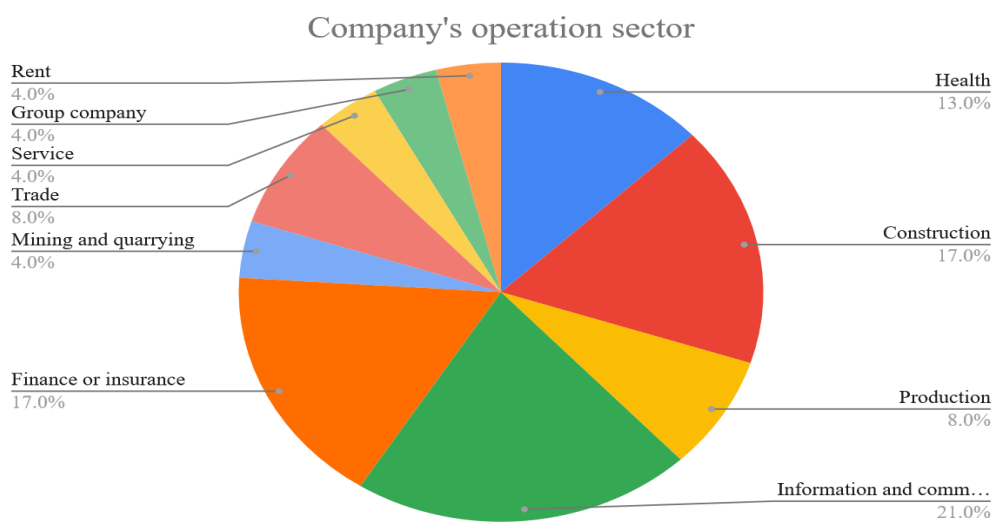


Figure 1. Industry of the respondents

As can be seen from the figure, companies in the fields of information and communication, construction, health, and finance and insurance are for the majority of the companies that participated in the survey.

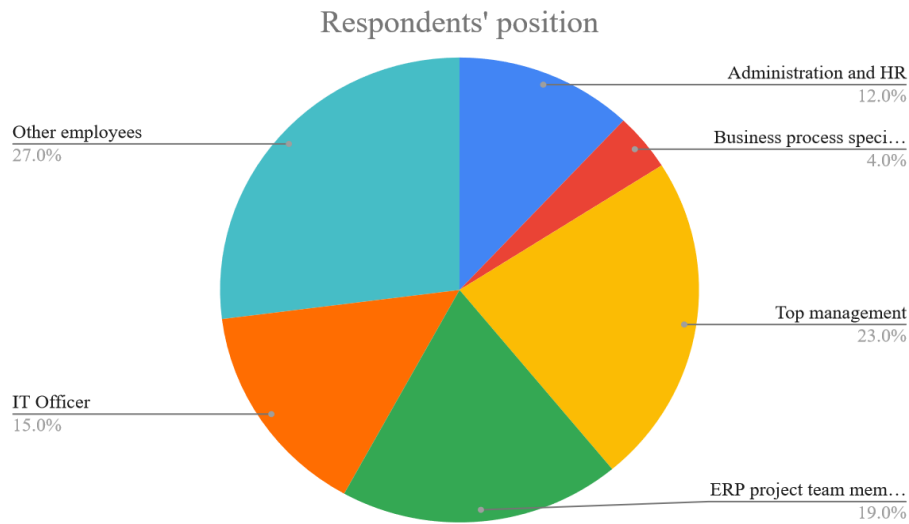


Figure 2. Position of the respondents

For the employees surveyed, TOP management, ERP project team members, IT department, and administrative HR officers were the most involved.

Organizations responded in survey have implemented the following ERP system modules. Figure 3 shows that 83.3% of the organizations participating in the study using the financial module of the ERP system. 62.5% of respondents said that they have implemented the inventory module and 16.8% have implemented all modules. From this, finance and accounting modules and inventory modules are used more.

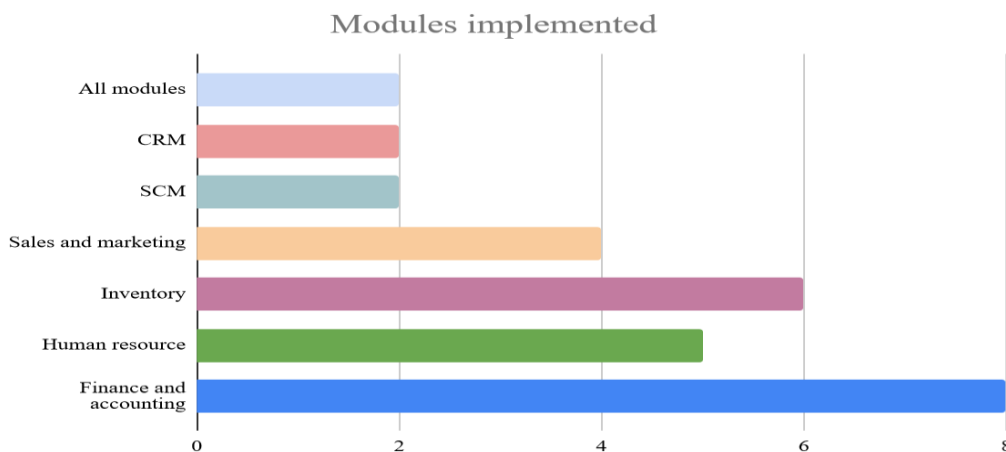


Figure 3. The modules of the ERP system implemented by the organizations

The questions related to the three-hypothesis raised in this study are as follows answered as: Did your organization implement ISO9001: Quality Management System? 46% of all participants answered “yes” for the question and the hypothesis-1 was not confirmed for the participants of this study.

Did your organization restructure to fit the ERP system? 54% of the respondents answered “yes” to the question and the hypothesis-2 confirmed for the respondents of this study.

When asked whether Blueprinting was done in the initial phase of the ERP project, 38% of all participants answered “yes” and 58% did not know, which did not confirm the hypothesis-3 for the participants of this study. Also, the organization does not provide complete information about the project to the participants of the ERP system led to the conclusion that.

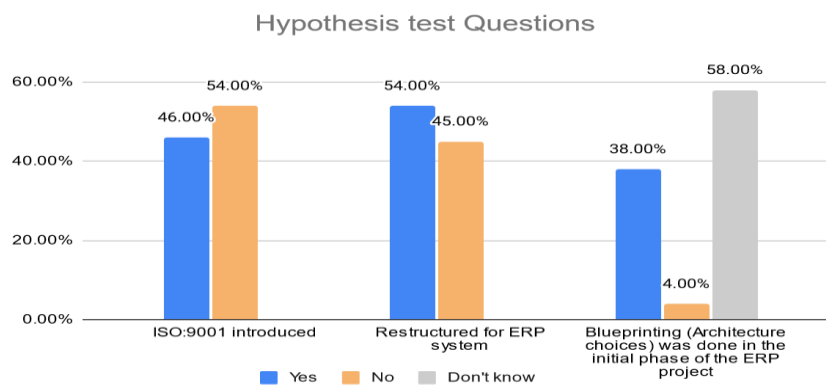


Figure 4. Hypothesis test questions

The impact of the factors influencing the successful implementation of the ERP system was evaluated on a scale of 1-5 and ranked by the total score. Based on international research, the factors affecting success are ranked from highest to lowest, and in this question, the “+” sign shows which participants will respond.

Table 3. Classification and ranking of success factors

No	The following factors are important for the successful implementation of an ERP system	ERP project team	TOP management	Administration and HR	IT department/team/office	Business process specialists	Other employees	Score	Rank of the research	International rank
1	Cooperation	+	+	+	+	+	+	112	1	24
2	Board	+	+	+	+	+	+	106	2	19
3	Training for every user	+	+	+	+	+	+	105	3	2
4	Support from all employees		+	+	+		+	86	4	43
5	Concentration on requirements of users	+	+				+	81	5	50
6	Business process redesign and process management		+	+		+	+	79	6	9
7	Organizational Culture/Culture Change	+	+	+	+	+		77	7	22
8	Communication between members of ERP project team	+			+	+	+	73	8	10
9	Empowered decision makers	+	+		+	+		72	9	32
10	Cognition of new business processes		+	+		+	+	72	10	17
11	Data and data quality	+			+		+	71	11	30
12	Official project plan/schedule	+	+		+	+		70	12	36
13	Implementing strategies	+	+	+		+	+	66	13	25

No	The following factors are important for the successful implementation of an ERP system	ERP project team	TOP management	Administration and HR	IT department/team/office	Business process specialists	Other employees	Score	Rank of the research	International rank
14	Ease of use of the system and user acceptance		+				+	60	14	35
15	Sufficient resources		+	+	+			57	15	41
16	Resources for projects		+	+	+			54	16	21
17	Project Management	+	+					53	17	3
18	ERP project leader	+	+					53	18	7
19	ERP project team skills	+	+					53	19	12
20	Communication between departments/teams/offices	+					+	52	20	6
21	Appropriateness of ERP system selection		+		+	+		51	21	11
22	Scope Management	+	+					48	22	39
23	Capacity of supplier of ERP systems		+	+		+		48	23	8
24	Business plan and long-term vision		+	+		+		48	24	33
25	Expectation management	+	+		+			47	25	20
26	Leading consultants	+	+					47	26	42
27	User project formal methods and methodology	+	+					47	27	51
28	Data analysis and conversion	+			+	+		45	28	27

No	The following factors are important for the successful implementation of an ERP system	ERP project team	TOP management	Administration and HR	IT department/team/office	Business process specialists	Other employees	Score	Rank of the research	International rank
29	Defined architecture	+			+	+		45	29	34
30	Clarity of vision, goals and objectives		+	+		+		45	30	4
31	Motivational factors for ERP system adoption		+	+				40	31	47
32	Effectiveness of Management to Reduce Customer Resistance		+	+				37	32	49
33	Supplier/customer partnerships	+		+				32	33	29
34	Collaboration between departments/teams/offices						+	30	34	26
35	Top Management support and responsibilities		+					28	35	1
36	Change management		+					28	36	5
37	Stakeholder trust		+					26	37	48
38	User engagement						+	26	38	16
39	ERP project team structure	+						25	39	14
40	Experienced Project Manager-Leader	+						22	40	40
41	Performance monitoring and evaluation	+						22	41	44
42	Use of tools developed by the supplier	+						18	42	28

No	The following factors are important for the successful implementation of an ERP system	ERP project team	TOP management	Administration and HR	IT department/team/office	Business process specialists	Other employees	Score	Rank of the research	International rank
43	Uncertain conditions that may arise during the project and its implementation				+			18	43	18
44	IT infrastructure				+			18	44	31
45	Opportunity for the IT department				+			17	45	38
46	Organizational compatibility with ERP systems			+				15	46	37
47	Technical issues				+			15	47	46
48	Suitability of legacy information systems				+			14	48	23
49	Compatibility with system settings					+		5	49	15
50	Ongoing ERP supplier support						+	-	50	13
51	Integration of ERP plan with business plan							-	51	45

Compared to the study results of other countries, the rank of ERP system success factors for selected organizations in Mongolia is very different. We concluded that respondents did not pay much attention to the methods and approaches commonly used internationally for the implementation of ERP projects. This creates the need for further research to assess whether Mongolian companies are fully utilizing the potential of the ERP system. Factors such as training for every user, Business process redesign and process management were ranked in the top 10 success factors, which is consistent with the results of other countries' research. The result was that the financial resources identified as the most influential in other countries are not so influential in our country. This is due to the fact that the system was not fully adopted by the respondents.

5. CONCLUSION

According to foreign studies, Implementing ERP system has a positive effect on the organization's operations, but there are 40-60% probability of failures due to any errors in the implementation phase. Therefore, as a researcher, we aimed to rank the factors that influenced the success of the organization that successfully implemented the ERP system in our country. The results of our study differ significantly from the results of studies conducted in other countries. ISO9001: The quality management systems implementation is below 50%, which means that the business process of the organization is not clear, and this is the basis for making the research results different from the other countries' results. Therefore, the following conclusion can be given only for the research participants.

Management methods and approaches (such as Change management, Project management, etc.) are ranked low, indicating a lack of management knowledge and experience of organizations implementing the ERP system.

Top management support was ranked at 35, leading to the conclusion that they do not attach importance to the implementation of the ERP system.

The lack of full utilization of the ERP system supplier's capacity raises doubts as to whether the system is being fully utilized.

The vision, goals and objectives of the organization are not considered important, but the support of all employees is considered important. This makes the research results contradictory.

The results of the study show the importance of training for each user of the ERP system. Therefore, before the implementation of the project, it is necessary to plan the curriculum and methodology very well.

According to the results of this study, the importance of project management ranked 3rd in the international level is underestimated compared to the importance of project management ranked 17th. This can lead to project failure and reduced results.

The lack of understanding of change management, which must be focus into project implementation, can be seen from the situation ranked 36th. As the key factors such as project management and change management are not considered important, the support of all employees is weak, and the getting their support is ranked 4th as one of the important factors.

RECOMMENDATIONS


Based on the results of the research, the following limited suggestions and recommendations can be given to all participants: Based on international experience, determine the stages of the project, introduce step-by-step guidance to all participants, and provide them with complete information. Make participants understand the value of this project and their role to feel. Improve managements' knowledge and skills.

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AUTHOR'S INTRODUCTION


1. First Author and Corresponding

	Ulziibayar Jambaldorj Ulziibayar.j@ufe.edu.mn
	Senior lecturer at the Department of Accounting, University of Finance and Economics, Ulaanbaatar, Mongolia Work field: Entrepreneurship, Financial literacy, Accounting

2. Co-Author

	Shuree Batzangia Shuree.b@ufe.edu.mn
	Lecturer at the Department of Accounting, University of Finance and Economics, Ulaanbaatar, Mongolia Work field: Information technology, Accounting

	Bayasgalan Baasanjav Bayasgalan.b@ufe.edu.mn
	Senior lecturer at the Department of Accounting, University of Finance and Economics, Ulaanbaatar, Mongolia Work field: Entrepreneurship, Accounting

	Enkhtsetseg Ginjaatar Enkhtsetseg.g@ufe.edu.mn
	Senior lecturer at the Program Innovation Hub, University of Finance and Economics, Ulaanbaatar, Mongolia Work field: Entrepreneurship, Accounting

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An analysis of research on thinking types of cadets

Bayartsetseg Avid • Delgerjav Munkhnasan



An analysis of research on thinking types of cadets

Bayartsetseg Avid¹, Delgerjav Munkhnasan^{2*}

¹*Doctorant of National university of Mongolia, Police major, Senior teacher of the School of Law and Social Sciences, University of Internal Affairs Mongolia, btsg.avid@gmail.com*

²*Ph.D, Associate professor, Head of the Department of Psychology, School of Art and Sciences, Division of Social Sciences, National University of Mongolia, delgerjav@num.edu.mn*

Abstract: There are few schools provide professional education that prepare special government employees who perform the security functions of Mongolia. This field's demand to take a consideration into cadets psychological and learning processes diversity is high. People are who study and are trained in these university are called cadets. Their training itself is unique procedure which provides psychological preparation. Therefore, it is necessary in the practice to bring distinction to the fore and take an interest to the difference between cadets thinking type and how some problems or characteristics playing a part in it. Within this purpose and need, G. V. Rezapkina's test (Cronbach's alpha value of the reliability of the test is 0.746) was used in order to find the distinctness of cadets thinking type and dissimilarity relation in between their learning characteristic and attitude of cadets who are students at University of Internal Affairs Mongolia. In this research the largest number of people is characterized by a visual and figurative thinking type, which was 549 cadets (74.6%) from the total of 735 participants from Police School, Border Office School, Emergency School and Court Decision Enforcement School. That being the case, we analyzed the difference relation in between the thinking type of cadets and school they are attending by using Kruskal-Wallis test, which resulted there was none. Abstract and symbolic type was resulted high on cadets who have positive attitude, whereas negative attituded cadets were resulted low.

Keywords: Cadet, Thinking type, Cadets psychology

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* Corresponding Author: Delgerjav Munkhnasan

1. INTRODUCTION

The need of an adjusted policy, study of distinction and a training for the qualified personnel was always necessity throughout Mongolia, and the world. Therefore, the special government service has been facing an issue of training specialist, who has to be eligible, follows special orders and has an unique duty. Three universities that government funded have been handling the training of the special government employees. University of Internal Affairs Mongolia prepares 66.6% of proffesion which is provided by law. Thus, the time of their training to be qualified personnel is undoubtedly crucial. Literature review on topic:

- In 2020, Enrique [1], 37 men and 35 women from the University of San Agustin de Arequipa, who are in the age of between 15-17, had participated in the research named “Relationship between Academic Procrastination and Attributions of Achievement Motivation” by Lois Enrique, in Peru. Result showed that relationship between procrastination and attributions of achievement motivation was inverse.
- In 2023, Khulan [2], A did a research on “Relationship between students individuality, skill of detecting emotions of others and empathy”. The result shows that a relationship between skill of detecting emotions of others and empathy is direct, which means empathy cannot exist without a skill of detecting emotions of others.

We conducted a research in the purpose of an analysis on cadets (students of University of Internal Affairs Mongolia) thinking type and our targets were conclude and analyze the empirical evidences of research which are cadets personality trait, thinking type and their other psychological characteristics.

Method of research was to find the relationship of thinking type by analyzing the data of cadets results of Russian scholar G. V. Rezapkina’s test which has been taken in the last 6 years.

There are few studies about psychological characteristics of cadets who are being trained to perform special duty to protect national security. That's why it is believed that clarifying the features of cadets thinking type and comparing them with the study of their features, professions and other psychological distinctions will have a significant impact on the learning process and training activities in the future.

2. LITERATURE REVIEW

The psychological problem of the cadet is a concept within the field of military psychology and police psychology of psychological science, and it begins with its clarification. A student who is being trained for a special government service in a basic military profession is called a cadet. According to the Mongolian nomenclature, it is explained as "listener" [3]. A cadet is a student and trainee at various military schools. The term is often used to refer to young people who are training to become military officers [4].

In Canada, the term "Cadet" refers to an officer in training, while in Germany, Cadet is a designation only for officers in training in the German Navy. The idea that a person goes through several stages of development that are common in throughout his life occupies an important place in Erikson's theory of stages of socio-psychological development. According to Erikson's theory, early youth covers 18-25 years. These stages are said to be regulated by epigenetic principles of development. Under the epigenetic principle, Erikson mentioned the following [5].

In principle, human development takes place in a hierarchical manner, and the transition from one stage to another is determined in advance by the person's readiness or preparedness for further development, the expansion of the social scale perceived by the person, and the growth of social interaction.

Generally, society is organized in such a way as to support the social development of the individual and to ensure both the possible pace and positive direction of this development. Erikson believed that personal development takes place throughout life, and from the beginning of youth, a person is ready for close relationships with others, both socially and sexually. And it is the time to acquire a profession, mature, and determine one's direction, which includes interpersonal communication, etc. One pole of this relationship is intimacy, and the other pole is isolation of itself.

According to E. Erikson [6], intimacy is a multifaceted and extensive problem. On the one hand, it includes self-identification without fear of losing anything, and on the other hand, it includes love and sex, as well as sincere friendship and trust. Trusting others and getting close to others depends on how well a person knows himself, and if he doesn't have a stable idea about himself, he can't really get close to others. According to Erikson, the positive aspect of development is love. Affection can express both sensuality and sexual meaning, and it is the ability to open yourself up to others when you feel you need to trust them. However, if you are overwhelmed by your own thoughts, focus too much on yourself, and start avoiding communication with others, the negative side of this stage of development will appear. If you cannot establish a stable, calm, friendly and trusting relationship with others, you will feel lonely and cut off from society. For such people, intimate relationships are avoided because they make demands on people, try their luck, and trust them. It is considered very dangerous at this stage of development if you become obsessed with your own thoughts, focus on yourself and avoid communication with others. If a person cannot establish a calm, reliable and stable relationship with others, a person becomes lonely and falls into a social vacuum (empty space) [7].

At this stage of development, achievements from the social side are very important. Achievements and successes in the social sphere have a great influence on the formation of human moral feelings. A person's sense of morality arises from the time when he realizes the value of his long-term friendship and his role in society. Thanks to all this, a person becomes ready to sacrifice himself for his cherished things. Thinking type includes the characteristics of a nation, behaviors, interests, consciousness, habits, symbols, customs, and traditions phenomena. The most stable aspect of the mentality of the nation is the character or behaviour of the nation [8]. It is a matter of considering how behavior relates to the creative quality of thinking process. Research findings have shown that different types of behavior are similar in creative thinking, but the ways to achieve success are different. That is why it is pointless to judge one characteristic of behavior against another as good or bad, and it is important to consider that one characteristic may be good

in a certain environment but bad in another environment in connection with the multifaceted process of life. Psychologically stable cadets have better communication skills, where interpersonal conflict is easier to deal with, which contributes to cooperation and effective work. Communication skills are vital in the military, where effective interaction and timely communication of information are vital. Psychologically stable cadets often have good listening and comprehension skills, as well as express their thoughts and ideas clearly and persuasively. In addition, psychologically stable cadets often have better control over their emotional and adequate responses during communication. A conflict situation in which they seek to compromise after taking into account the views of others, who are more tolerant. All this contributes to improved cooperation and effective teamwork. Cadets with advanced communication skills make it easier to connect with others, build trusting relationships and maintain a positive team atmosphere. Communication skills training is an important component of the development psychological stability of cadets. It not only helps them to successfully cope with interpersonal conflicts, but also a great support for the effective performance of official duties [9].

Psychologically, it creates an environment that contributes to the development of communication skills, a more harmonious and productive education for cadets, and prepares for successful service and communication in the future community [10].

Attitude is defined as “the general direction of a phenomenon, thought, or idea.” A positive or negative evaluation of people, ideas, objects, or events [11]. The simple structure of a person's response to an object or problem, which is more or less determined by emotional, cognitive experiences, and behavioral responses. Attitudes, on the other hand, indicate a person's current mental state. Interpersonal attitudes are the basic part of mutual actions, such as being understood and perceived by each other in varying degrees, thinking objectively, being excited, and feeling. [12].

3. RESEARCH DESIGN AND RESULT

A total of 735 cadets participated in the study by taking a Thinking Type test from students who studied at the University of Internal Affairs of Mongolia in 2019-2020 and 2020-2021.

Survey data from cadets who did not meet the 50% threshold for survey results were considered invalid and excluded. The research results were processed using SPSS-26 and Microsoft Excel.

3.1 Appendix

Excercise 4. Given time: 15minutes, Instructions: Read each question and put a checkmark next to the question that you agree with. There are no good or bad questions here, so don't waste time thinking.

No	Type	Yes	No
1	It is easier to do something yourself than to explain it to others		
2	I am interested in developing computer programs		
3	I like to read books		
4	I like painting, sculpture and architecture		
5	I try to improve my work		
6	If you explain the lesson and the picture to me, I can understand it very well		
7	I like to play chess		
8	Able to express one's thoughts verbally and in writing		
9	When I read a book, I can clearly see the protagonist and the story		
10	I strive to do my planned work independently		
11	I like to make everything by hand		
12	As a child, I used my own special key to communicate with my friends		
13	What I am saying adds to the importance of the item		
14	When I hear a familiar melody, a picture or an image is created in my head		
15	Different passions make human life rich and bright		
16	It's easy for me to find trial and error in advance when solving a goal		
17	I feel like dancing when I listen to music		
18	I am very interested in the work of TV and radio presenter and journalist		
19	It's easy for me to imagine animals and things that don't exist in nature		
20	I try to master the exact sciences (mathematics, physics).		
21	When I was a child, I liked to create with small objects		
22	I try to master the exact sciences (mathematics, physics).		
23	The deep meaning of some poems really appeals to me		
24	The deep meaning of some poems really appeals to me		
25	I don't want to dictate my life to a certain system		
26	I feel like dancing when I listen to music		
27	It is not difficult for me to speak in front of any audience		
28	I like exhibitions, plays and concerts		
29	I'm especially skeptical of things that others say are obvious		
30	I love making things by hand		
31	I'm curious about deciphering the hidden meanings of ancient symbols		
32	I love making things by hand		
33	I learn the rules of language structure easily		
34	I understand and enjoy the beauty of nature and art		
35	By the way, I don't like to go alone		
36	The truth can only be grasped by hand		
37	I'm curious about deciphering the hidden meanings of ancient symbols		
38	I can easily understand formulas, symbols, and case notation		
39	It's easy for me to recall the content of a movie or an event		
40	I don't always rest until I've done my job perfectly		

3.2 Participants in the study

735 students of the University of Internal Affairs Mongolia participated in the survey, 44% of the total participants (323 students) participated in 2019-2020, and 56% (412 students) participated in 2020-2021.

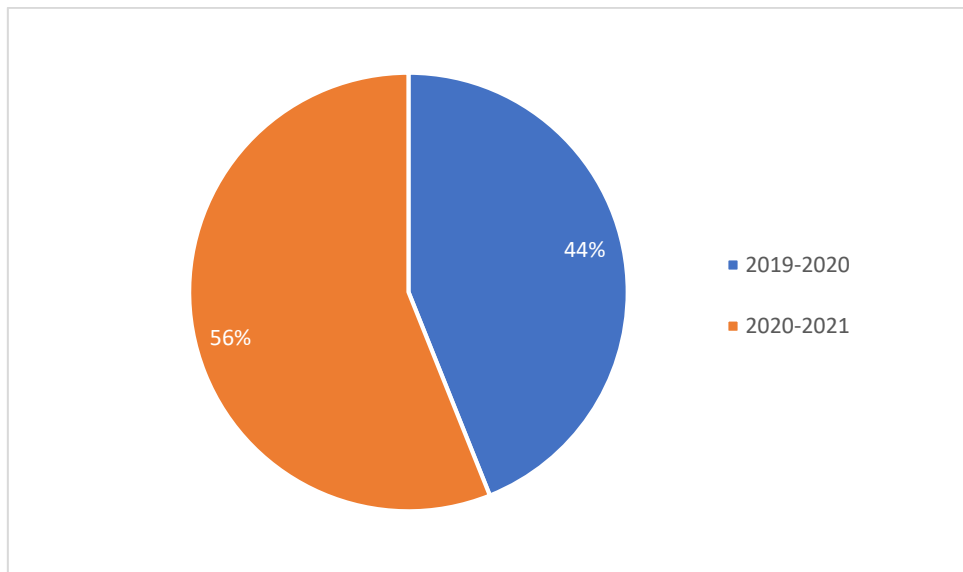


Figure 1. Number of participants

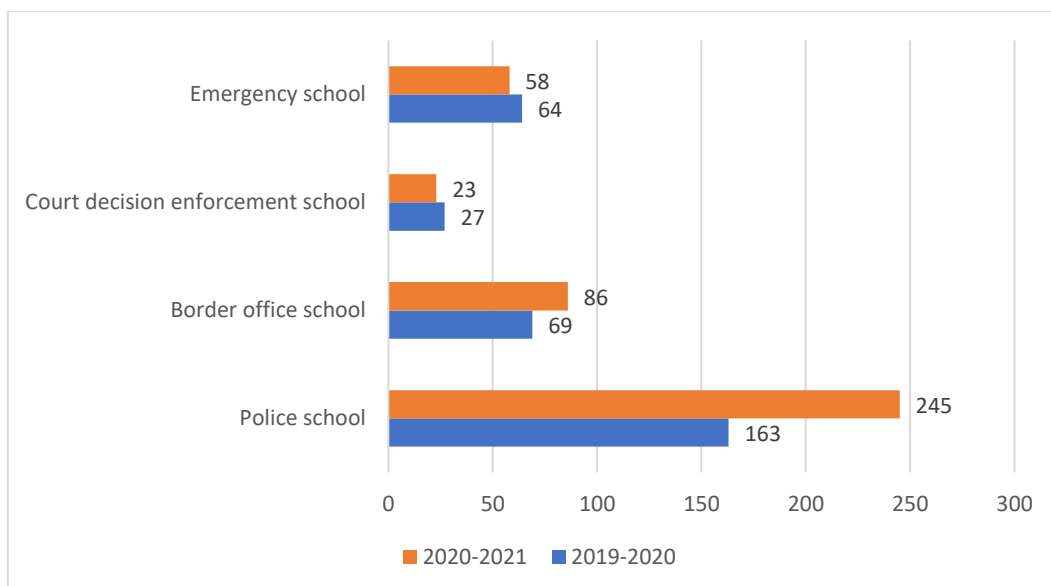


Figure 2. Number of participants per school.

Taking into account the cadets by each school, in 2019-2020, 64 cadets from the Emergency School, 27 from the Court Decision Enforcement School, 69 from the Border Office School, and 163 cadets from the Police School participated. In 2020-2021, 58 students from the Emergency School, 23 from the Court Decision Enforcement School, 86 from the Border Office School, and 245 from the Police School participated.

3.3 Reliability

When analyzing the reliability of the test of G. V. Rezapkina, a Russian scientist who studies thinking types, the alpha value was 0.746, and it was a reliable research method.

Table.1 Cronbach's Alpha Based standard

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.746	0.728	40

3.4 Distribution

The distribution was examined by the Kolmogorov-Smirnov test, which revealed a non-normal distribution. Therefore, non-parametric analysis was used to develop the results. Result of thinking type is shown in

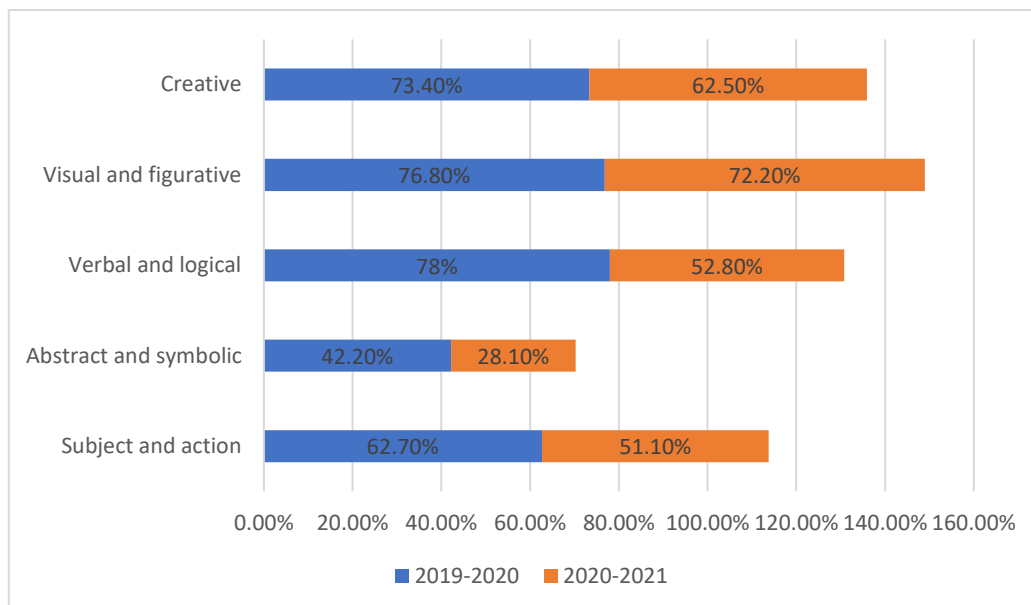


Figure 3. Thinking types of participants

735 cadets took part in the study, 416 cadets or 56.5% of them were subject and action thinking, 254 cadets or 34.5% of abstract and symbolic thinking, 271 cadets or 36.8% of verbal and logical thinking, 549 cadets or 74.6% of visual and figurative thinking, 498 cadets or 67.7% of creative thinking showed up higher. However, 481 or 65.5% of all participants showed weak abstract-symbolic thinking.

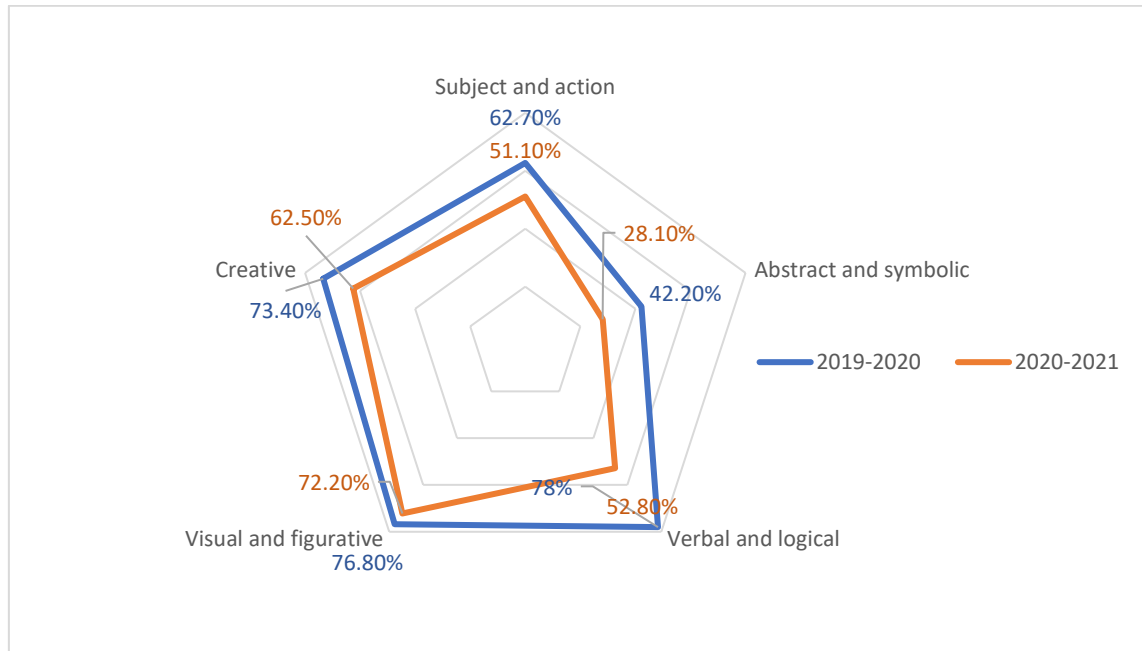


Figure 4. Comparison of thinking type of study participants by year of enrollment

The following results were obtained by comparing the thinking type of all the cadets who participated in the study according to the year of enrollment. The participants who showed higher characteristics of real action thinking accounted for 62.7% of the total participants in 2019-2020, while in 2020-2021 they accounted for 51.1% of the total participants and decreased. The percentage of cadets who are higher in other "Abstract-Symbolic", "Verbal-Logical", "Visual and Figurative" and "Creative" thinking patterns has also decreased compared to the previous year. Kruskal -Wallis analysis of whether this age-related difference was statistically significant revealed significant differences in mental patterns other than the " Visual and Figurative " pattern.

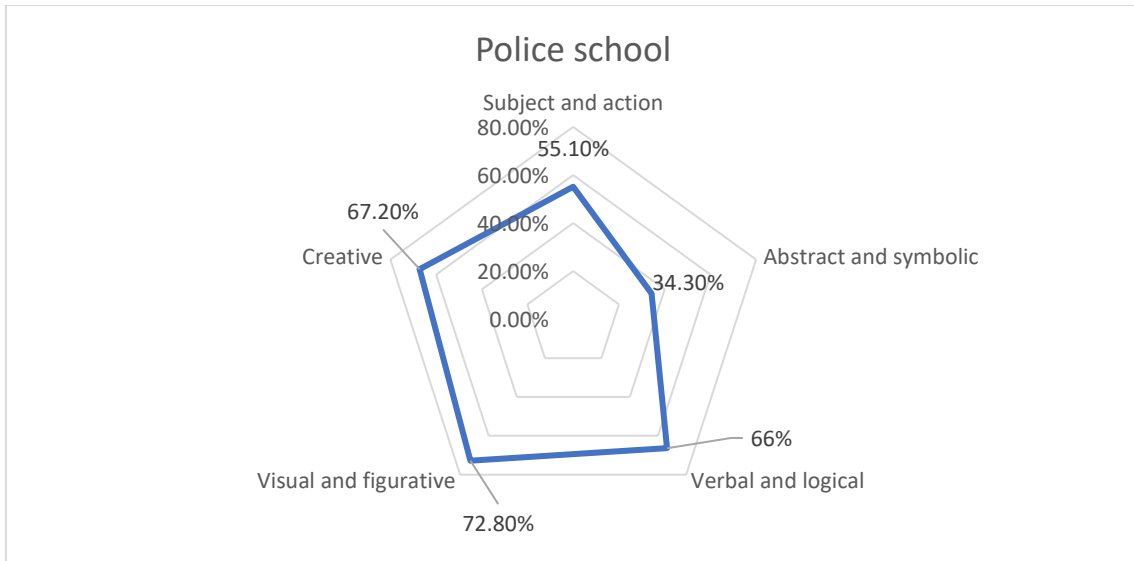


Figure 5. Result of Police school's cadets thinking type

In the police school, students with a preference for the subject and action thinking type make up 55.1% of all participating students, students with a preference for the abstract-symbolic type make up 34.3%, and students with a preference for the verbal-logic type are the highest compared to other schools which are 66.4%, 72.8% of students with a preference for visual and figurative type, and 67.2% of students with a preference for creative type respectively.

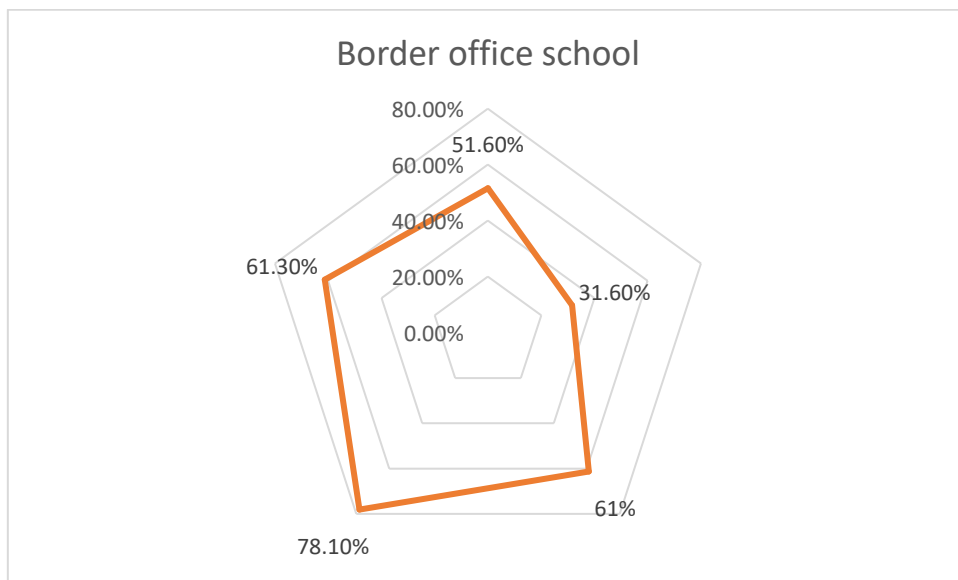


Figure 6. Result of Border office school's cadets thinking type

In the case of Border Office School, students with a preference for subject and action thinking type make up 51.6% of all participating students, 31.6% for students with a preference for abstract-symbolic type, and 61.3% for students with a preference for verbal-logic type, the students with a preference for visual and figurative type are the highest (78.1%) from other schools, and students with a preference for creative type are 61.3%, respectively.

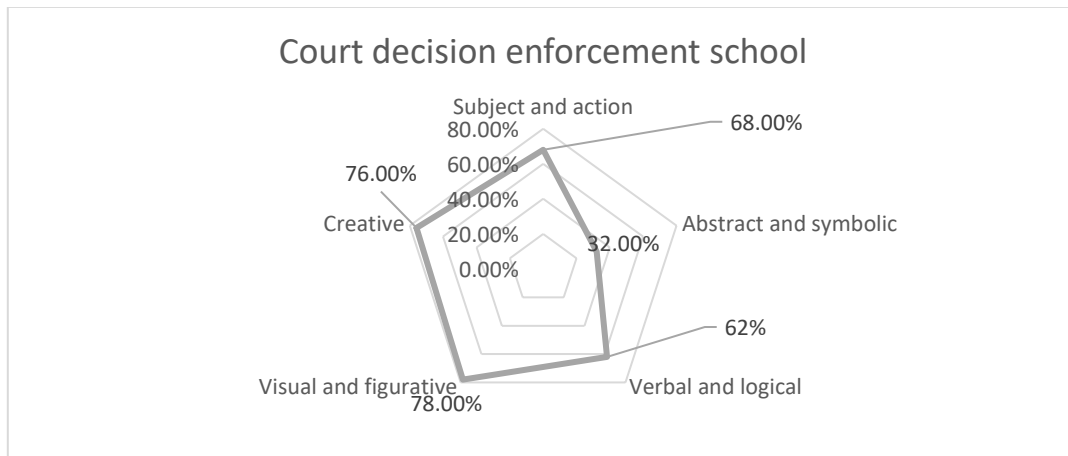


Figure 7. Result of Court decision enforcement school’s cadets thinking type

Compared to other schools, students with a preference for the subject and action thinking type of the Court decision enforcement school accounted for 68% of all participating students, while students with a preference for the abstract-symbolic type accounted for 32%, and those with a verbal-logic type accounted for 62% of type, 78% of students shows visual ad figurative type are also resulted the highest creative type which is 76%, respectively.

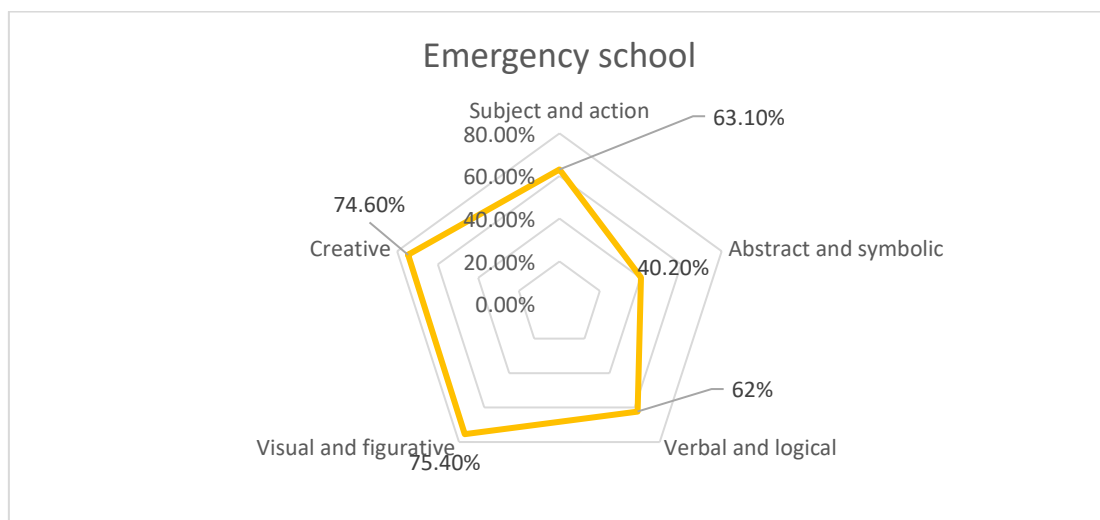


Figure 8. Result of Emergency school’s cadets thinking type

In the case of emergency schools, students with a preference for subject and action thinking type account for 63.1% of all participating students, while students with a preference for abstract-symbolic types have the highest percentage (40.2%) of other schools, and a preference for verbal-logic patterns are 62.3% of the students, 75.4% of the students with a preference for the vision and figurative type, and 74.6% of the students with a preference for the creative type respectively.

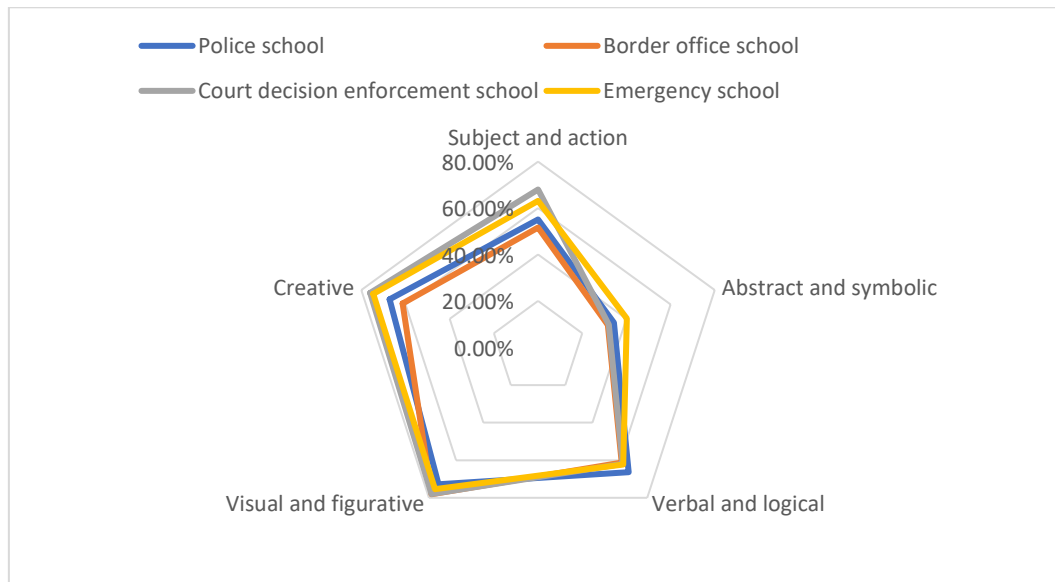


Figure 9. According to each school of thinking of the participants.

The thinking type of the research participants were compared according to the school they are studying in. The Kruskal-Wallis analysis of whether there are differences in these thinking type based on the school of the cadets did not reveal any significant differences. However, the Police School is in the "Verbal-Logical" type of thinking, the Border Office School is in the "Visual and figurative" type of thinking, Court Decision Enforcement School is in the "Subject-Action" and "Creative" types of thinking, and the Emergency Schools cadets percentage is higher in the "Abstract-Symbolic" type of thinking. The results of comparing thinking types with attitudes and learning motivation are shown in Figure .

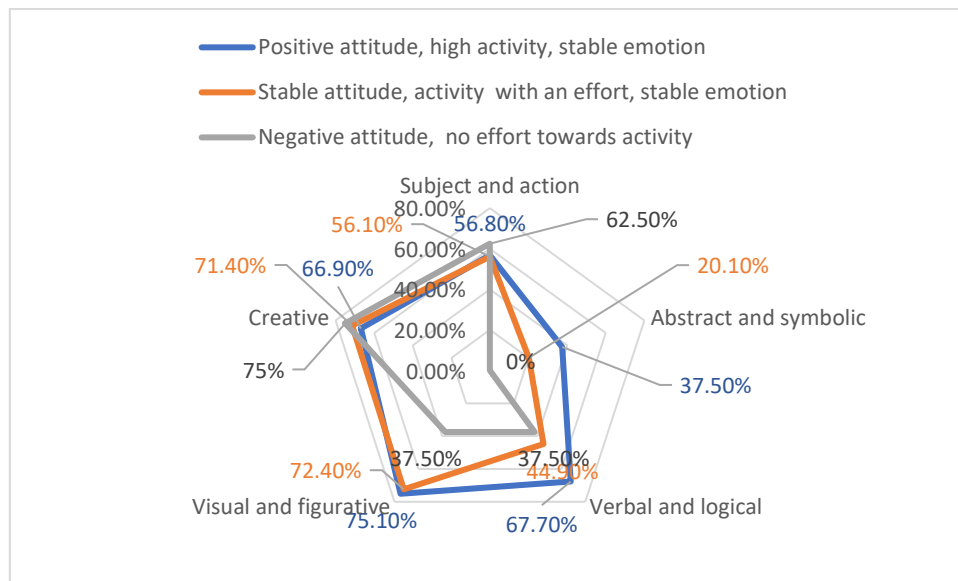


Figure 10. For each thinking type in comparison with learning attitude.

The following results were observed if the percentage of participants with higher thinking types among the total number of participating students was considered for each of their attitudes. The more mature the attitudes of the students who participated in the research were, the more their thinking types were revealed.

Table 2. Test Statisticsa,b

	e1 Hyper- thymic trait of person- ality	e2 Mania trait of personalit y	e3 Provin g trait of person ality	e4 Extre me check ing trait of personalit y	e5 Depres sed trait of person ality	e6 Anxiet y trait of person ality	e7chan ging trait of person ality	e8 Timid and excited trait of person ality	e9 Emotio nal trait of person ality	e10 Unstable trait of personali ty
Kruskal-Wallis H	1.855	4.332	7.855	1.947	4.204	3.087	11.718	3.415	2.616	1.31
df	2	2	2	2	2	2	2	2	2	2
Asymp. Sig.	0.395	0.115	0.02	0.378	0.122	0.214	0.003	0.181	0.27	0.519

a Kruskal Wallis Test

b Grouping Variable: r1 Attitude

The following results (오류! 참조 원본을 찾을 수 없습니다.) were observed if the percentage of participants with superior thinking patterns among the total number of participating students was considered for each of their attitudes. As the attitudes of the students who participated in the study matured, their abstract thinking patterns were revealed as superior.

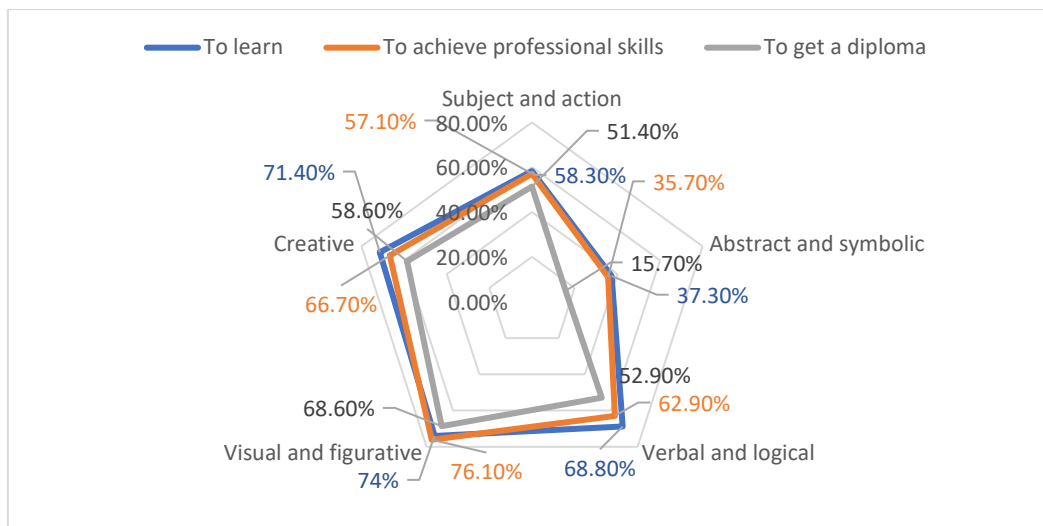


Figure 11. Participants thinking type in comparison with each motivation

The share of cadets with the motivation to get a diploma and the dominant thinking type is lower than the share of the cadets with the motivation to acquire knowledge and professional skills and the dominant thinking type.

No difference was observed between the percentage of students with the motivation to acquire knowledge and to acquire a professional skills, and with a dominant mental thinking type.

When the Kruskal-Wallis test was used to check whether the above two parameters were supported by statistical analysis, only the "Abstract-Symbol" and "Verbal-Logic" thinking types revealed statistically significant differences.

4. CONCLUSION

A total of 735 cadets took part in the research, and for them, vision and figurative thinking and creative thinking type were dominant, and abstract-symbolic thinking was weak.

The Kruskal-Wallis analysis of whether there is a difference depending on the profession of the studied cadets did not reveal any significant differences, but for the listeners of all schools, vision and figurative thinking type was dominant, and for the cadets of the Emergency School, the dominance of creative thinking was high.

Proportion of cadets with high results of "Abstract-Symbolic", "Verbal-Logical" and "Vision and figurative" thinking types among students with low activeness and negative attitude and

emotionally stable students with positive attitude and high activeness were different. Percentage of emotionally stable and active students is higher than the percentage of students who show low activity and an effort. A Kruskal-Wallis test was used to determine whether this low value was statistically significant, and a statistically significant difference was found.


As cadets' attitudes matured, their abstract thinking types were revealed. This proves that attitudes have a positive effect on the formation of thinking types. With the completion of this research, it is important to take into account the effectiveness of the learning process of the cadets, the introduction of active learning methods suitable for their mental characteristics, and the management of multifaceted social work. It is also believed that the results of the study can guide the personal relationship, attitude and motivation between the teacher and the cadets.

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AUTHOR'S INTRODUCTION

1. First Author

	Bayartsetseg Avid btsg.avid@gmail.com
	Doctorant of National university of Mongolia, Police major, Senior teacher of the School of Law and Social Sciences, University of Internal Affairs Mongolia Work field: Legal Psychology, Forensic Psychology

2. Corresponding – Author

	Delgerjav Munkhnasan delgerjav@num.edu.mn
	Ph.D, Associate professor, Head of the Department of Psychology, School of Art and Sciences, Division of Social Sciences, National University of Mongolia Work field: General psychology, Developmental Psychology, Education science

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Culturally responsive school leadership and education for sustainable development

Tuul Suvd • Munkhbayar Namsrajav • Battsooj Sukhbayar •

Gerelt-Od Erdenebileg



Culturally responsive school leadership and education for sustainable development

Tuul Suvd¹, Munkhbayar Namsraijav^{2*}, Battsooj Sukhbayar³,
Gerelt-Od Erdenebileg⁴

¹Associate Professor, School of Physical Education, Mongolian National University of Education, Tuul@msue.edu.mn

²PhD in Linguistics, School of Social Sciences and Humanities, Mongolian National University of Education, munkhbayar@msue.edu.mn,

³PhD in Educational Studies, School of Fine Arts and Technology, Mongolian National University of Education, battsooj@msue.edu.mn,

⁴Associate Professor, School of Social Sciences and Humanities, Mongolian National University of Education, gereltod.erdenebileg@msue.edu.mn

Abstract -This study aims at assessing the current status of how school leadership influences on the implementation of ideas of education for sustainable development (ESD) in actual educational practices of culturally diverse schools. In applying theories of culturally responsive school leadership and explaining principles of education for sustainable development from Mongolian perspectives, the study designed a set of criteria to assess how school leadership influences on the promotion of ideas of education for sustainable development in Mongolia. A sample of 50 culturally diverse schools comprising both eco and regular schools in Ulaanbaatar and rural districts of Mongolia were selected as key participants of the study to observe actual educational practices in the area of education for sustainable development. The school principals were assigned with the dual tasks of completion of pre-printed questionnaires to identify the major problems they face when mainstreaming ideas of education for sustainable development in different school contexts; and to determine what initiatives school leaders initiate to create school climate for promotion of education for sustainable development in culturally diverse schools.

Keywords - School leadership, Education for sustainable development, Culturally diverse school

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* Corresponding Author: Munkhbayar Namsraijav

1. INTRODUCTION

The educational leadership, more specifically teacher and school leadership for Education for Sustainable Development (ESD) is gaining momentum in Mongolia. For the past few years, schools in Ulaanbaatar and different regions of the country started to offer extra-curricular activities in the areas of environmental education and local school leadership, so school leaders made attempts to transform their school facilities and environment in ways to make them ecologically more responsible. However, the “green development” in eco schools marked only the beginning of ESD.

More recently, the Ministry of Education and Science communicated its intent to move onto the next stage and lead the change to *mainstream* Education for Sustainable Development across whole school and support new ESD activities inside as well as outside of the school. Such a comprehensive approach implies not only greater attention to environmental education but in addition also means a commitment to knowledge, skills, and applications that relate to social-cultural and economic issues. In line with the global movement towards a sustainable development, the three pillars of ESD—environmental, socio-cultural, and economic — were likely to be rolled out in schools and communities of Mongolia over the past few years.

The Ministry of Education and Science and the Ministry of Environment and Green Development worked hand in hand to accomplish this 21st century task. This article presents an exploratory study on *what role* culturally responsive school leadership plays in ESD implementation in actual educational practice and *how much* and *how* ESD is currently implemented and mainstreamed at classroom and school level.

This study aims at assessing the current status of how school leadership influences on the implementation of ideas of education for sustainable development in actual educational practices of culturally diverse schools.

2. THEORETICAL BACKGROUND

Culturally responsive school leadership is to take the lead to make a momentous decision to effectively meet the students’ needs to possess important skills to learn culturally and socially different classroom [1][2], while using culturally relevant and culturally responsive pedagogies [3][4]. In the classroom of students with diverse needs, teachers are obliged to manage it in more inclusive and culturally comprehensive ways [5]. In emphasizing the urgent need of reformation and transformation of all features of educational organizations such as planning policies, management, and budget allocation, school leaders must create the whole school culture and climate to fulfill the different needs of culturally diverse student while leading possible changes in teachers’ culturally responsive teaching [2]. Although pedagogy cannot solve all the problems faced with learners, the attempts to make major changes in teaching styles are needed to influence on the society and heal the inequities in social, political and economic lives of the country.

Education reform initiators have claimed that culturally responsive school leadership plays an important role in promoting a self-sustaining school environment in which highly qualified teachers are attracted, maintained and supported. Good school leaders make right decision to employ well-experienced teachers who are able to manage their teaching in more learner-friendly manner and to transform school facilities and environment in ways to make them ecologically more responsible [6] [7].

Culturally responsive school leadership and education for sustainable development

The components of culturally responsive school leadership can be understood as school context, leadership style, and cultural fluency [8]. School context is the connection between all the stakeholders of the school such as from state to local leaders, from school leaders to school teachers, from teachers to students, parents and communities and so on [9]. Leadership style is adopted by school leaders in accordance with the common and special need of the receiving society. Cultural fluency is to respond to the students and parents from various backgrounds, ethnicities, socioeconomic status, and minorities in community [10] where the issues of sustainable development are addressed.

The ideas of education for sustainable development are to make any possible changes that need to be initiated by school leaders to redesign the socio-cultural environment of school context through progress, services, and accomplishment of ESD's vision [11]. School leaders, as change agents, must empower learners with the ESD perception, competence, rules of conduct, and ways of thinking of how make changes for their self-sustaining future [12]. Thus, the main focus in this article is on the assessment of the current situation of the relationship between school leadership and ESD development in culturally diverse schools.

2.1 Understanding ESD from Mongolian perspectives

The school management in Mongolia have been continuously transformed and progressed by the influence of globalization as well as individualization and accordingly arranged for the promotion of ESD. From Mongolian worldview [13], ESD can be understood as an interconnectedness of all the phenomena that form one world. Moreover, this means everybody has led any changes with one's leadership skills while creating his own sustainability literacy based on the life experiences and developing attitudes and outlooks towards any issues or phenomena in one world [14]. This, in turn, tells that any ESD-related actions initiated by school leaders can be integrated and implemented in educational practices of culturally diverse schools.

3. RESEARCH DESIGN

The main task of the study was to carry out an assessment of influence of school leadership in ESD implementation. The study was carried out over a period of ten months from August 2022 to June 2023. The objectives of the study are:

- (1) To identify the major problems they face when mainstreaming ideas of education for sustainable development in different school contexts; and
- (2) To determine what initiatives school leaders initiate to create school climate for promotion of education for sustainable development in culturally diverse schools.

A sample of 50 culturally diverse schools comprising both eco and regular schools in Ulaanbaatar and rural districts of Mongolia were selected as key participants of the study to observe actual educational practices in the area of education for sustainable development. To accomplish the proposed goal, the study raised two research questions:

- (1) What are the major problems school leaders face when mainstreaming ESD in different school contexts?
- (2) What do school leaders initiate to create school climate for ESD promotion in culturally diverse schools?

Culturally responsive school leadership and education for sustainable development

3.1 Composition of the Research Team

The team consists of eight members - four ESD experts and four graduate students earning their degrees in educational studies. First, all the team members have been trained to build a common understanding of ESD and school leadership. The team is divided into two groups: one focused on the observation of school climate and the other on questionnaire from school leaders.

3.2 Methodological Overview

The distinctive methodological characteristics of the study are:

- (1) The use of statistical techniques to identify the major problems school leaders face when mainstreaming ESD in culturally diverse schools; and
- (2) The use of microscopic analysis to provide a detailed description of the school climate regarding ESD

3.3 The Study and Data

The main study is concerned with the assessment of the current status of the relationship between culturally responsive school leadership and ESD implementation. With the emphasis in this study is on the major problems and initiatives, it is intended to observe actual educational practices in 50 culturally diverse schools.

This study did not evaluate learning outcomes of students in terms of ESD and therefore, only focused on observations of actual educational practice in classrooms and schools.

3.4 Sample of Selected Schools

Team members were asked to visit schools and to observe actual educational practices in the area of ESD. For this purpose, 2 sub-teams were provided a combination of schools with prior ESD exposure (“treatment group”) and those without prior ESD exposure (“control group”). The two types of schools were not randomly selected and therefore, they do not represent the larger population of ESD and non-ESD schools in Mongolia.

A total of 50 schools were visited; of them 16 were in Ulaanbaatar and the rest were in 14 different provinces Gobi-Altai, Khovd, Sukhbaatar, Darkhan, Selenge, Bulgan, Orkhon, Tuv, Uvurkhangai, Arkhangai, Khentii, Dornogobi, Dundgobi, and Gobisumber. Figure 1 presents the distribution of schools in the sample.

Schools with ESD exposure in particular projects include: 11 SDC eco schools, two UNESCO eco schools, and one GIZ green school. Interestingly, seven additional schools self-identified as “eco schools” even though they were not officially included as a partner school in any of the environmental education projects.

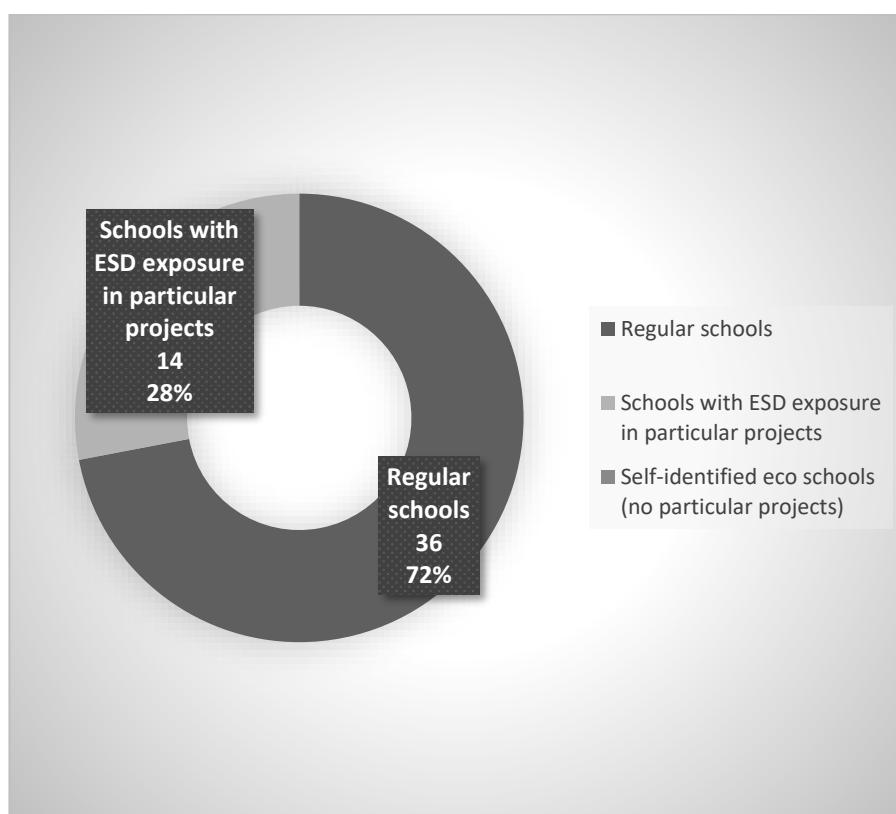


Figure 1: Sample of schools

Data Collection Instruments

The following instruments were developed to obtain standardized baseline data on the mainstreaming of ESD in culturally diverse school contexts:

- Microscopic analysis (observations, survey, interviews on actual practice):
 - i. Classroom observation instrument: 8 pages
 - ii. School climate observation: 1 page
 - iii. Guideline for expert team report: school visit – 5 pages

The instruments for the analysis of school climate observation comprise both items from international ESD standards and curricular frameworks as well as national items. Most of the international items in these research instruments are built upon the following well-known studies and frameworks of ESD:

- UNESCO's Education for Sustainable Development Toolkit [15] [†]
- World Values Survey 7 (WVS 2017-2022) [‡]

[†]McKeown, R., Hopkins, C. A., Rizi, R., & Chrystalbridge, M. (2002). *Education for sustainable development toolkit*. Energy, Environment and Resources Center, University of Tennessee.

[‡]Questionnaire for wave 7 (2017-2022) is available online: www.worldvaluessurvey.org

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Importantly, all elements or topics used in the checklist of classroom and school climate observations were adapted and appropriated to the Mongolian context. The list of international elements or topics was supplemented with Mongolian concepts that are related to the socio-cultural, economic, and environmental dimensions of ESD.

The initial list of Mongolian elements or topics included the following:

- Socio-cultural dimension: conflict between nomadic and sedentary culture, party politics and parochialism, political deals and negotiations, cultural values and heritage, violence, cultural reform, cultural criticism, quality and access to service, system of religion and beliefs, social freedom, ethics and national standards, rights of future generations, social depression, information and media dictatorship
- Environmental dimension: rehabilitation, indigenous knowledge of nature, man, flora, and fauna, rural development
- Economic dimension: limited resources of Mother Earth, production and consumption, sustainability and development, excessive consumption

Based on a pilot-test, the Mongolian elements or topics were revised. Topics that were considered repetitive, ambiguous, or irrelevant during the pilot-test were eliminated from the study.

4. RESULTS

4.1 Problem identification

The pre-printed questionnaire was distributed and the respondents were allowed to tick three major problems they face while promoting ESD in their school contexts. As shown in Table 1, the major three problems were (1) school leaders' ESD knowledge, skills, application – 13 (26%); (2) school leaders' understanding ESD as a concept – 9 (18%); and (3) capacity-building of school leaders – 9 (18%).

Table 1: Major problems facing school leaders to implement ESD

<i>Problems n (%)</i>	
School leaders' ESD knowledge, skills, application	13 (26%)
School leaders' understanding ESD as a concept	9 (18%)
Capacity-building of school leaders	9 (18%)
Adaptation of ESD into Mongolian cultural beliefs	7 (14%)
Global ESD movement	5 (10%)
Global ESD literacy	4 (8%)
Misperception of leadership issues, unwillingness to accept ESD-related issues, and participate in ESD-related extra-curricular activities	2 (4%)
Lack of self-confidence	1 (2%)
Total:	50 (100%)

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4.2 Classroom and School Climate Observations

The study compared eco schools (N = 14) with regular schools (N = 29). The so-called self-reported eco schools (N=7) were excluded from this comparison in order to measure project effects. The two types of schools are remarkably similar with the exception of two areas:

- Eco schools are clearly “greener” in the sense of planting trees, school garden, etc. than regular schools
- Eco schools tend to also organize more intensively ESD related extra-curricular activities (e.g., eco clubs, initiatives of schools, local community, etc.) even though regular schools attach great value to these kind of extra-curricular activities

The main difference between eco schools and regular schools is their commitment to trees and plans and to afterschool eco clubs. Other than these two markers of eco schools, project schools did not display a greater sensitivity towards social, cultural or economic inequality nor did they differentiate themselves in terms of greater ESD mainstreaming into the official curriculum.

- Figure 2 presents comparison between regular schools and eco schools, and it includes four aspects of school organization. Clearly, eco schools are more likely than regular schools to be “green” in terms of their outside environment. Nevertheless, eco schools are not different than regular schools in terms of commitment to social issues, and ESD mainstreaming in the curriculum and in the extra-curriculum.

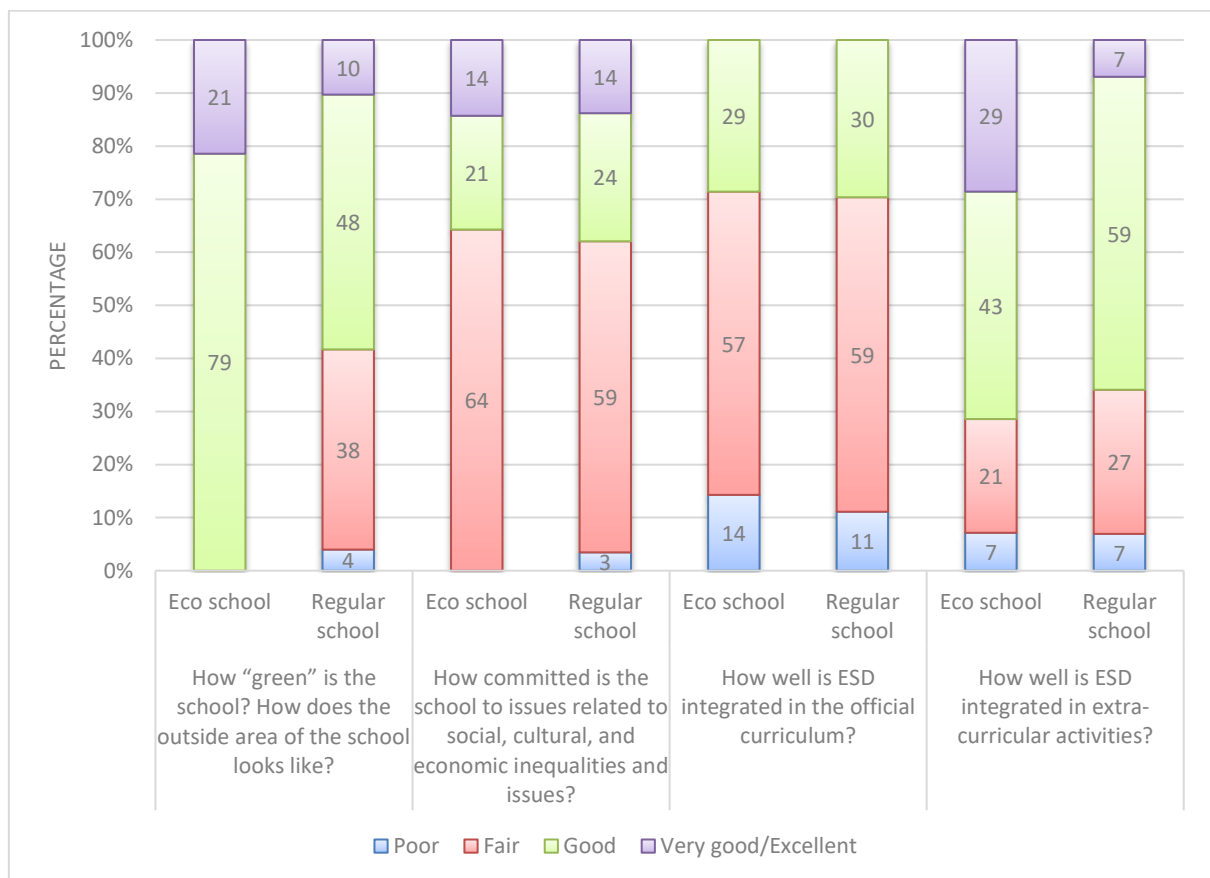


Figure 2: Supportive organizational climate for ESD, by school type

Culturally responsive school leadership and education for sustainable development

- Figure 3 presents comparison between regular schools and eco schools, and it includes two types of resources. School leaders in eco schools are more likely to have access to ESD resources. However, eco schools are not different than regular schools in terms of community engagement.

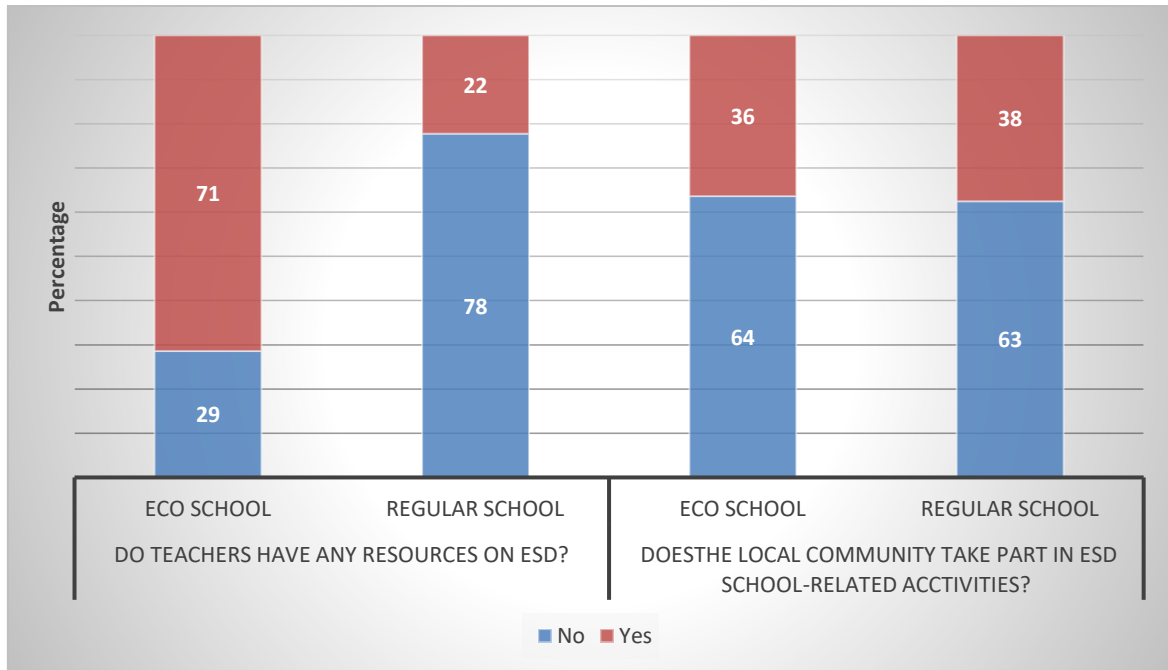


Figure 3: Availability of ESD resources, by school type

The school climate is good and healthy, but it does not support meaningful engagement with ESD.

- Overall, school climate seems to be positive and healthy. Almost half of the schools were evaluated, by the experts, as doing excellent or good in various dimensions. For example, more than four-fifths of schools (84 percent) were evaluated as doing excellent (29 percent) or good (55 percent) in terms of presenting posters and flyers that support gender equity.
- In Figure 4, school climate, however, seems not to support ESD in terms of modeling good pro-environmental behavior. For example, more than half of schools were evaluated as doing average or insufficient in terms of having separate bins for trash/waste and recycling (61 percent) and greening of school years (55 percent).

Culturally responsive school leadership and education for sustainable development

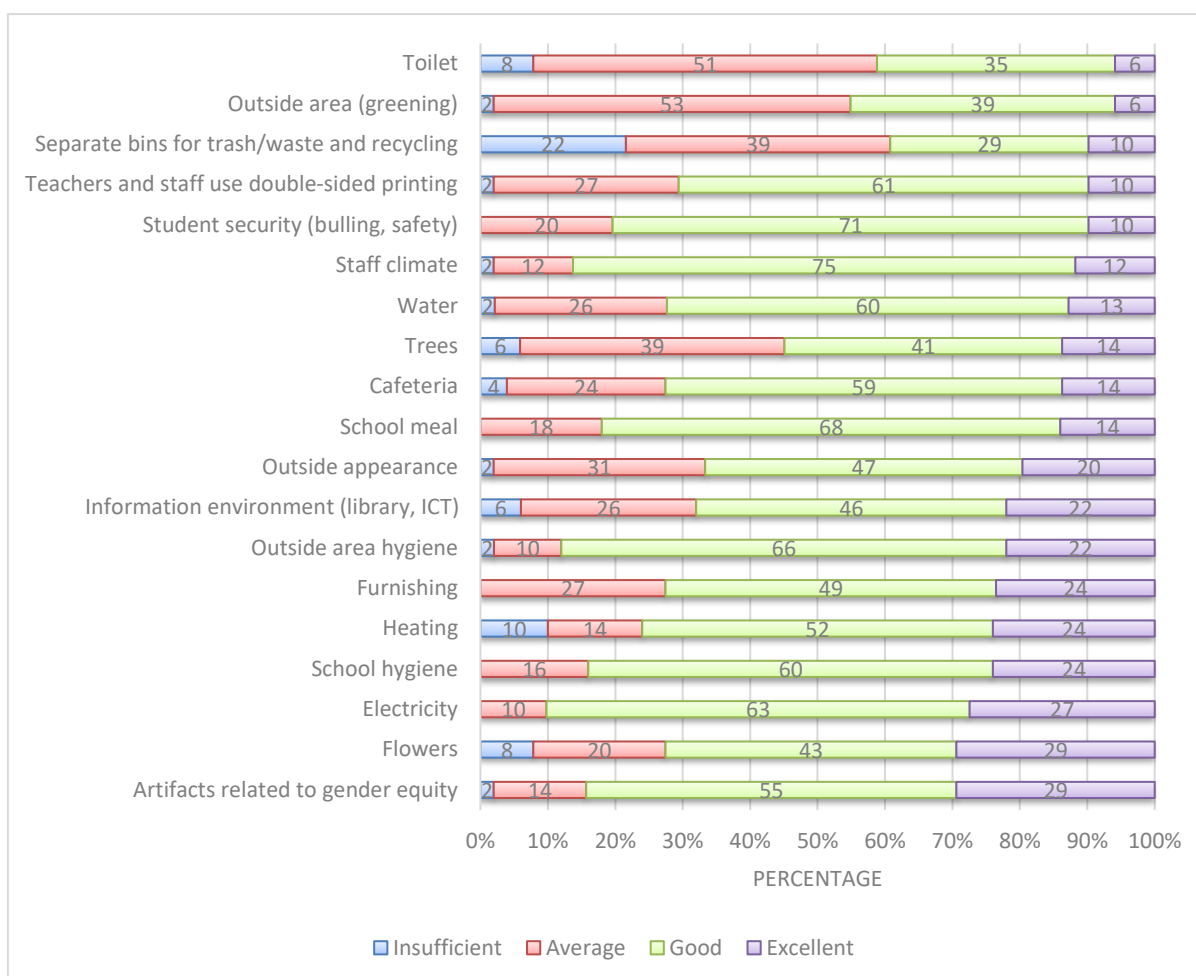


Figure 4. Dimensions of school climate

5. CONCLUSION

The study has reached to the following conclusions:

- The major problems for ESD engagement are (1) school leaders’ ESD knowledge, skills, application; (2) school leaders’ understanding ESD as a concept; and (3) capacity-building of school leaders in Mongolia.
- The school leaders need to attend in-service training to get a better understanding on how to use ESD concepts to strengthen specific competencies.
- There is a need to train and mentor school leaders in how to integrate ESD across subjects, in and out of the classroom, and in the local community.
- There is a need to share the broader context on sustainable development and instill a sense of global responsibility for sustainable development in all countries including Mongolia.

Culturally responsive school leadership and education for sustainable development

Based on a microscopic analysis of observations at school and classroom level, the study finds that ESD is not sufficiently integrated and adequately implemented at classroom and school level. The findings indicate the followings:

Comparison of Eco and Regular Schools: The school leaders' commitment to trees and plans and afterschool eco clubs were different in both eco and regular schools. Other than these two markers of eco schools, regular schools did not display a greater sensitivity towards social, cultural or economic inequality, nor did they differentiate themselves in terms of greater ESD mainstreaming into the official curriculum.

School leaders' knowledge, skills, application. Currently, the focus is on school leaders' ESD knowledge. The scope of ESD needs to be expanded to include a focus on skills and applications. School leaders need to attend in-service training to get a better understanding on how to use ESD concepts to strengthen specific competencies (e.g. learning through action, inquiry-based learning, distinguishing between facts and opinions) and applications (e.g. ecological awareness, civic engagement, advocacy for sustainable development, engagement for social justice, sensitivity for equity and poverty).

Understanding ESD as a concept. Currently, ESD in schools is not taught as a concept that links environmental, socio-cultural, and economic aspects of environment. There is a need to teach ESD holistically as a concept with consequences for thinking, acting and living responsibly.

Capacity-building of school leaders. There is need to train and mentor school leaders in how to integrate ESD across subjects, in and out of the classroom, and in the local community.

Adaptation of ESD into Mongolian cultural beliefs. Concepts on the eco-system and sustainable development resonate with traditional Mongolian beliefs on man and nature. The link between international ESD concepts and cultural beliefs in Mongolia needs to be elaborated and conceptualized in order to teach ESD more effectively to students in Mongolia.

Global ESD movement and global ESD literacy. There is no awareness in schools of Mongolia about the broader debates and international agreements on sustainable development. There is a need to share the broader context on sustainable development and instill a sense of global responsibility for sustainable development in all countries including Mongolia.

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AUTHOR'S INTRODUCTION


1. First Author

	Tuul Suvd tuul@msue.edu.mn
	2011 PhD in Education Studies, Mongolian National University of Education Work: Associate Professor, Department Chair, Department of Physical Education, School of Physical Education, Mongolian National University of Education Work field: Physical Education, Educational Studies

2. Corresponding Author

	Munkhbayar Namsrajav munkhbayar@msue.edu.mn
	2016 PhD in Linguistics, The University of the Humanities, Mongolia Work: Senior Lecturer at the English Department, School of Social Sciences and Humanities, Mongolian National University of Education Work field: English Education, Linguistics, ESP, ESL

3. Co-Author

	Battsooj Sukhbayar battsooj@msue.edu.mn
	2021 PhD in Education Studies, Mongolian National University of Education Work: Dean of School of Fine Arts and Technology, Mongolian National University of Education Work field: Art Education, Educational Studies

	Gerelt-Od Erdenebileg gereltod.erdenebileg@msue.edu.mn
	2011 PhD in Education Studies, Mongolian National University of Education Work: Associate Professor, Department Chair, Department of Physical Education, School of Physical Education, Mongolian National University of Education Work field: Political Science, Gender Studies

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A study of depression in military personnel

Nyamjav Baasandorj • Delgerjav Munkhnasan



A study of depression in military personnel

Nyamjav Baasandorj¹, Delgerjav Munkhnasan^{2†}

¹Doctoral student, National University of Mongolia, nyamjav0819@gmail.com

²PhD, Department of Psychology, National University of Mongolia, delgerjav@num.edu.mn

Abstract— Recently, as the media has broadcast information about crimes committed by military personnel, society's negative opinion about military personnel continues to attract public attention. In light of this situation, military psychologists are confronted with the need to study depression, fear, and anxiety among servicemen, as they continue to commit criminal acts such as desertion, misuse of weapons and firearms, and incidents of self-harm or harm to others. In this study, we administered a survey to servicemen who have recently enlisted and proceeded to analyze the correlation between depression and the adjustment to military life among active-duty military personnel. The study reports that among 129 newly recruited military personnel, 9 percent exhibited moderate depression, and 15 percent displayed severe depression. According to the adaptability survey, 50 percent performed averagely, 17 percent performed poorly, and 6 percent performed very poorly. The results indicate a direct relationship between depression and adaptability, demonstrating that lower levels of depression have a lesser impact on adaptation.

Keywords— Depression, adaptability, Military life, Active-duty military Personnel.

1. INTRODUCTION

A study was conducted by the National Legal Institute of Mongolia, in cooperation with General Authority for Border Protection, investigating serious crime perpetrated by the Border Guard between 2015 and 2020, with the aim of identifying underlying causes and conditions. According to the research, 36.4 percent of suicides were perpetrated by temporary military personnel, 27.3 percent by sergeant, and 23 percent by officers. Regarding violations and crimes associated with weapons and firearms, 66.7 percent were determined to be intentional, while 33.3 percent were deemed unintentional. Notably, the

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majority of intentional offenses were committed by temporary military personnel, sergeants and officers [1].

These data underscore the necessity for comprehensive evaluations of emotional states, including fear, anxiety, depression, and propensity for risk-taking behaviors, particularly among individuals of military age. Through the examination of depression, military psychologists posit that alongside enhancing conscripts' satisfaction with their military service, fostering in their service, and their ability to adapt to military life, there exist tangible pragmatic advantages.

For newly enlisted servicemen, military service can be challenging to remain psychologically calm while experiencing a completely different environment from ordinary life. The high level of supervision, meticulously structured 24-hour regimen, strict adherence to military protocols, daily responsibilities, readiness for service, and demanding training requirements can have negative impact on their adaptation to military life. The majority of temporary military personnel are between the ages of 18 and 25 and may exhibit emotional immaturity, leading to various psychological issues. Hence, most do not volunteer for military service. In light of this situation, we aimed to study following;

First. Military psychologists are confronted with the need to study depression, fear, and anxiety among servicemen, as they continue to commit criminal acts such as desertion, misuse of weapons and firearms, and incidents of self-harm or harm to others.

Second. Recently, due to the weak ability to adapt to the changing environment, the problem of running away from military service due to depression and suicide continues to occur. 36.4% of them are conscripts[1]. Therefore, we decided to conduct this research.

Third. In this study, we aimed to investigate the relationship between temporary military personnel's depression and adaptation to military life.

2. THEORETICAL BACKGROUND

Within the theoretical framework of the thesis, representatives of major psychological trends such as C.Lange, W.James, A.Leontiev, P.Anokhin, S.Rubinstein, P.Simonov, H.Dalgado, L.Festinger, V.Viliunas, Lindsay-Hebby, Benevik, Holton, C.Izard and S. Schachter are considered[2]. Depression originates from the term "deprimer" indicating feelings of sadness or a low mood. It is expressed in various forms and durations, ranging from a few months to several years. Individuals may experience depressive episodes following the loss of their deeply held values or beloved individuals. Notably, values are subjective and unique to each person. While everyone experiences occasional bouts of sadness as a natural response to challenging circumstances, depression extends beyond mere feelings of sadness to encompass physiological changes [3].

With this quality, emotions are involved and play an important role in the process of human behavior. Since its creation, humans have been adapting to new environments and reacting to them[4].

In his work, K. Izard regarded depression as an innate emotion characterized by genetic and physiological components. Symptoms of depression encompass reduced interest in activities, diminished energy and productivity, slowed movement and speech, feelings of sadness, anxiety, discontentment, and restlessness. Every aspect of the environment elicits negative emotions and pessimism, permeating an unpleasant atmosphere. Consequently, every occurrence within the surroundings, whether it be music or conversations among people, prompts feelings of aversion[5].

In the context of depression, individuals often exhibit a deceleration in the pace of thought formation and speech articulation, leading to manifestations such as slowed cognitive processing, subdued vocalization and limited verbal expression. Commonly observed are repetitive questioning and responses characterized by succinct replies such as “yes” or “no”. Furthermore, individuals with depression typically harbor a pessimistic perspective encompassing retrospection, current circumstances, and prospects. Additionally, there is a tendency towards overestimation of personal deficiencies and a proclivity for fixating on adverse past experiences[2].

In the future, this self-blame as a criminal and sinner can turn into delusions of depression. Under such circumstances, the individual may become entrenched in the conviction that they are “worthless wretched, wicked, sinful, or culpable” potentially leading to self-harming behaviors aimed at alleviating this distressing state.

A depressed individual may experience suicidal ideation, believing that death is preferable to continuing to live in their current state, and may devise specific suicide plans. Ultimately, they might impulsively attempt suicide without alerting those around them and may conceal their suicidal thoughts from others.

A depressed patient’s motivation, desire, interest, need, and initiative decrease. Their actions slow down. The patient spends most of their time involuntarily not working, sitting with their face down on the bed, or lying under the covers. Decreased appetite and sexual desire, accompanied by a rejection of food and drink due to symptoms such as nausea and aversion to meals, are common. Interest in daily activities, including eating and working, diminishes, leading the patient to neglect self-care. Signs of frequent sighing and tearful crying are clearly evident.

During depression, individuals may experience physical symptoms such as enlarged pupils, constipation, elevated heart rate, and weight loss.

Depression classified into mild, moderate, and severe categories. Criteria for determining the severity include:

- Feelings of depression
- Loss of energy
- Inactivity
- Decreased pleasure, desire, and interest in activities
- Reduced ability to concentrate
- Insomnia and restlessness
- Digestive issues
- Perceptions of being dispensable
- Self-condemnation

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- Inability to be critical of the environment
- Psychomotor retardation
- Weight loss
- Other symptoms may arise from internal organs

In cases of mild depression, only two or three of the aforementioned symptoms are typically evident, and while the individual experiences feelings of depression, they are able to continue with their work. In essence, their capacity to work remains intact[3]. In moderate depression, four or more of the aforementioned symptoms manifest. The individual experiences significant depressive feelings, making it exceedingly challenging to sustain work. Their work capacity is substantially diminished, and they begin encountering various challenges in their professional responsibilities. In cases of severe depression accompanied by signs of cognitive decline, most of the aforementioned symptoms are evident: feelings of depression, reduced self-confidence, increased self-criticism, and thoughts of or engagement in suicidal behavior. Observable changes in internal organ function become more pronounced. Additionally, alongside these symptoms, hallucinations, confusion, psychomotor slowing, or seizures may occur. These hallucinations and delusions could be either psychosomatic or non-psychosomatic in nature. The severity of the depression escalates to the point where individuals may struggle to fulfill their usual responsibilities [7].

3. RESEARCH DESIGN AND RESULT

The purpose of this prospective study we investigate the relationship between temporary military personnel's depression and adaptation to military life.

First, we utilized Beck's Depression Inventory test, second adaptability study, and third we used SPSS program, Pearson correlation coefficient, and Homogeneity test methods. The study included total 129 newly recruited military personals in November 2023 Ulaanbaatar Mongolia.

3.1 Reliability analysis

The results of the study were processed using SPSS software using reliability analysis, Person's correlation, Homogeneity test and LSD multivariate analysis. After analyzing the validity and reliability of the research data before processing the research results, the Cronbach's alpha coefficient is 0.841, which is sufficiently reliable.

Table 1. Reliability analysis

Reliability Statistics	
Cronbach's Alpha	N of Items
.841	41

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According to the research results, 58 percent of temporary military personnel are not experiencing depression, 18 percent have mild depression, 9 percent have moderate to severe depression, and 15 percent have severe depression.

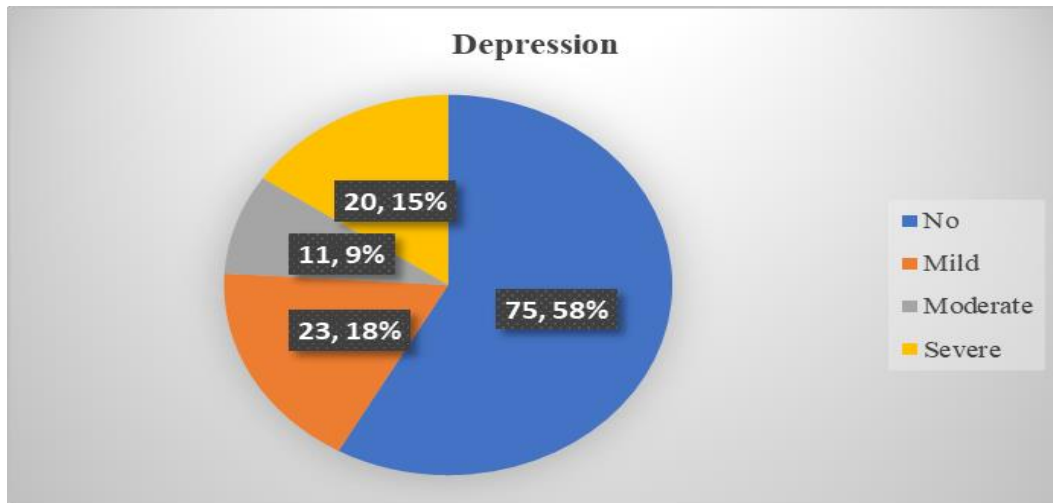


Figure. 1. Depression

Over 40 percent of the respondents reported experiencing depression. Despite new warriors appearing to be adults, their life experiences, knowledge of risk protection and prevention, and cautious behaviors are not yet fully developed. Consequently, the support and guidance of adults remain crucial. Understanding the nuanced relationships, attitudes, feelings, and demands of this age group is a unique aspect. The improper approach and communication attitude of leaders can potentially exacerbate the crisis within this age group. Hence, officials working with military-age youth can foster a conducive environment for their successful completion if military service by acquiring effective methods and knowledge that consider their developmental and psychological characteristics.

According to the adaptability survey, 27 percent (35 soldiers) of temporary military personnel were rated as very good, 50 percent (65 soldiers) as average, 17 percent (22 soldier) as poor, and 6 percent (7 soldiers) as very poor.

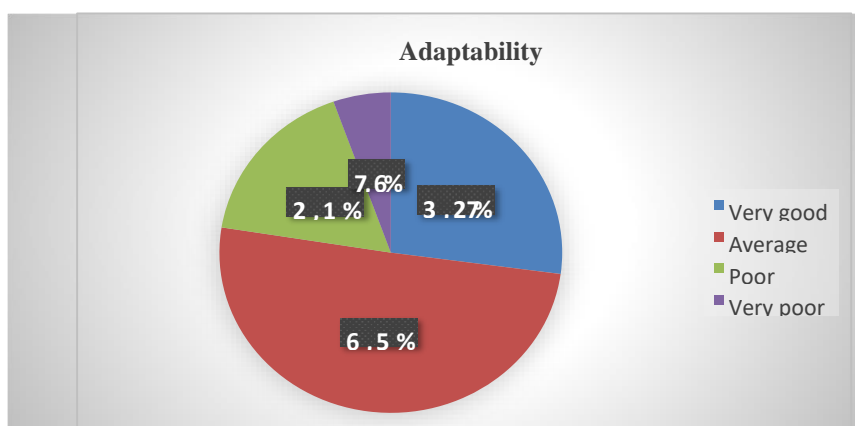


Figure. 2. Adaptability

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Over 50 percent of the study participants exhibit average or low adaptability, suggesting psychological restlessness when faced with the transition into a social environment vastly different from their everyday lives, and when encountering the daily training and preparation demands, This implies that their capacity to adjust to military life is relatively weak.

The ability to effectively adapt to situational demands and navigate unforeseen challenges inherent in the fulfillment of official duties within unique contexts is notably influenced by the interplay between leaders and governing authorities.

Upon analyzing the impact of the four levels of depression on adaptability, a notable correlation emerges between adaptability and depression. Furthermore, the average adaptability group signifies depression-free rates across the overall distribution.

In contrast, the severe group is associated with low adaptability, indicating that lower levels of depression have a diminished impact on adaptability.

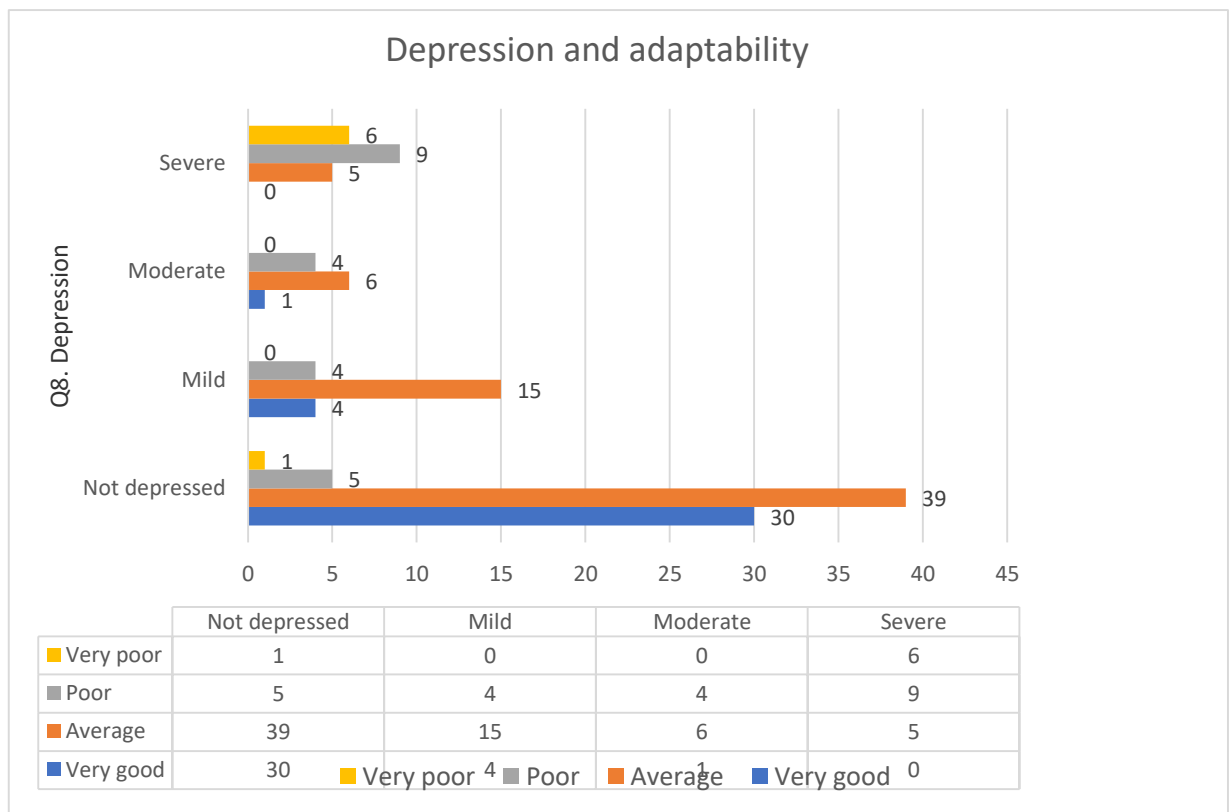


Figure 1. An index of the correlation between depression and adaptability

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It can be observed from Figure 3 that a high correlation exists, as demonstrated by Pearson's correlation analysis during statistical processing.

Table 2. Pearson's Correlation Analysis of Depression and Adaptability

Correlation			
		Adaptability	Depression
Adaptability	Pearson's correlation	1	.582**
	Sig. (2-tailed)		.000
	Sample	129	129
Depression	Pearson's correlation	.582**	1
	Sig. (2-tailed)	.000	
	Sample	129	129

It can be seen from table 2 that it is highly correlated between depression and adaptability by Pearson's correlation analysis of statistical processing.

Table 3. Homogeneity Test Analysis of Depression and Adaptability

Depression					
	Q6. Adaptability	N	Subset		
			1	2	3
Student-Newman-Keuls ^{a,b,c}	Very good	35	1.17		
	Average	65	1.65		
	Poor	22		2.77	
	Very poor	7			3.57
	Sig.			.128	1.000

The non-depressed group exhibits comparable adaptability to the average group, with adaptability being influenced by the personality characteristics of the non-depressed cohort. Conversely, the mild depression group aligns with the low adaptive group, while the severe depression group aligns with the very low adaptive group, underscoring the impact of depression levels on adaptive capacity.

4. CONCLUSION

Despite the implementation of various measures aimed at enhancing the adaptability of new conscripts to military service, incidents of crimes and disciplinary violations associated with maladjustment among the temporary military personnel continue to persist. According to the research, 58 percent or 75 of the conscripts were not experiencing depression, while 18 percent or 23 exhibited mild depression, 9 percent or 11 showed signs of moderate depression, and 15 percent or 20 were identified as having severe depression. Additionally,

more than 40 percent of the respondents reported experiencing depression. While new warriors may seem like adults, their life experiences, understanding of risk protection and prevention, and cautious behavior are not fully developed. Therefore, the guidance and advice of adults remain crucial. The cultivation of nuanced relationships, attitudes, feelings, and demands is a distinctive characteristic of this age group.

The improper approach and communication attitude of leaders may contribute to the crisis within this age group. Therefore, officials working with military-age youth can facilitate a conducive environment for their successful completion of military service by acquiring effective methods and knowledge that consider their developmental and psychological characteristics. According to the adaptability survey, 27 percent (35) of temporary military personnel were rated as very good, 50 percent (65) as average, 17 percent (22) as poor, and 6 percent (7) as very poor.

Over 50 percent of the study participants exhibit average or low adaptability, suggesting psychological restlessness as they navigate the transition into a social environment vastly different from ordinary life, along with the demands of daily training and preparation. This indicates a relatively poor ability to adapt to military life.

This study identified a direct relationship between conscripts' depression and their adaptation to military life. Furthermore, depression emerged as the primary determinant in classifying soldiers based on their level of adjustment. The study's results highlight the significant role of depression in the psychological domain, with issues in this area underlying maladjustment. Soldiers who experience lower levels of depression tend to exhibit higher levels of self-confidence, interest in service, pride in themselves and their service, and better stress management abilities. This suggests that depression significantly influences military life and its potential to cause harm.

Acknowledgments

1. Officials tasked with working with military-aged youth should endeavor to learn and implement effective methodologies that consider their developmental and psychological characteristics. By doing so, they can foster a conducive environment that facilitates the successful completion of their military service.
2. Consistently provide psychological counseling and support services to address relationship issues encountered by military servicemen, including temporary military personnel. The objective is to normalize their relationships and psychological well-being, instilling a sense of enjoyment and pride in their military service.
3. When offering psychological counseling to conscripts, prioritize their voluntary requests and attentively listen to their concerns. Provide assistance in overcoming difficulties, support their needs, and guide them in making informed decisions.
4. Officials working with soldiers should attentively observe and communicate with each soldier, fostering a positive atmosphere in their interactions. They should listen to and respect soldiers' wishes and, if necessary, collaborate with psychologists to address any needs.
5. To create an environment where temporary military personnel can seek guidance from psychologists to address feelings of anxiety, anger, depression, loneliness, and

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unhealthy behavior habits. This entails providing professional psychological counseling services and enhancing support systems to facilitate improvement in mental health services.


6. The findings of the aforementioned study underscore the necessity of regularly organizing activities such as psychotherapy and psychological support. These interventions are crucial for addressing negative emotional symptoms, including depression, anxiety, and frustration, stemming from workplace stress and office conditions.

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AUTHOR'S INTRODUCTION

1. First Author

	Nyamjav Baasandorj nyamjav0819@gmail.com
	<p>Doctral student at the Department of Psychology, School of Arts and Sciences, Division of Social Sciences, National University of Mongolia, Ulaanbaatar, Mongolia</p> <p>Work field: Educational Psychology, Military Psychology Expeirence: 21 year of working with Border military service</p>

2. Corresponding – Author

	Delgerjav Munkhnasan delgerjav@num.edu.mn
	<p>Head of Department of Psychology, School of Arts and Sciences, Division of Social Sciences, National University of Mongolia, Ulaanbaatar, Mongolia</p> <p>Work field: Lecturer at Department of Psychology, School of Arts and Sciences, Division of Social Sciences, National University of Mongolia, Ulaanbaatar, Mongolia</p>

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Misheel Institute for Young Researcher's NGO

32. Chinggis avenue, 24/1, Khan-Uul district, Ulaanbaatar 15160, Mongolia

E-mail address: misheelinstitute@gmail.com, info@youngres.com

Phone Number 1: (+976)-77858388

Phone Number 2: (+82)-1085192072
