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# Comparative analysis of intellectual abilities differences of Mongolian and Chinese students

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### Comparative analysis of intellectual abilities differences of Mongolian and **Chinese students**

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Abstract - H. Gardner's test with 108 questions in 9 chapters to assess the intellectual abilities of Mongolian and Chinese students (language, logic, mathematics, spatial, musical, physical movement, interpersonal communication, self-management of human culture, communication with nature, existence) [2] conducted a study to identify and provide study advice tailored to their differences. The survey was translated into Mongolian and Chinese and data was collected online between September 11-21, 2023. In processing the research results, using SPSS 29 software, summary statistics, Reliability Statistics, Independent Samples Test and ANOVA test methods were used. Correlation analysis was performed to estimate correlation between groups. According to some results, for all the students involved in the study, the competencies of self-management (88.3%), existence (84.5%), and communication with nature (82%) are relatively high, as well as spatial competence (72.5%), physical ability (64.9%). ), interpersonal skills (61.3%) have reasonable indicators, but language (56.6%), music (55.5%), logical mathematics (55%) have weak results, Music, interpersonal, human internal culture, self-management, nature Students from both countries had statistically significant differences in communication and social skills. **Keywords** - Intellectual ability, Mongolian Chinese students

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#### 1. INTRODUCTION

In the age of information technology, there is a need for students to acquire many skills in order to adapt to their society. The issue of the development of future professionals or students is not only related to the issue of future development, but it will definitely determine the direction of the country's development. Therefore, students need to manage their learning by finding specific methods that suit their learning difficulties, learning styles, and intellectual abilities. In order to support students to learn successfully, it is important to provide equal opportunities by organizing courses that take into account the differences that are appropriate for their learning styles and intellectual abilities. Although students in the same classroom are the same age group and live in the same era, they have different learning styles, preferences, food, and preferences. Therefore, it is necessary for teachers to create learning opportunities suitable for each student according to their differences, and to provide different guidance. For this, it is important for the teacher to understand the following points and pay attention to organizing the training. For example, each student not only grew up in different families, has his own culture, but also has different social and economic opportunities. It is also very important to provide equal opportunities by organizing the training taking into account the fact that each student has different learning characteristics, different knowledge and abilities, thinks differently, and is interested in different things. In modern times, to improve the quality and results of education, the tendency to organize lessons and activities taking into account the differences of each student is becoming popular. This approach has been developing in the developed countries of the world since the 1960s, developing and testing teaching models and methods that take into account the differences of students, and carrying out various researches [2].

In this study, we aimed to find out the level of intellectual ability of Mongolian and Chinese students by using the comprehensive intellectual ability test of Scientist Howard Gardner and find out whether it can be used in future training.

The central tenet of Gardner's theory is that all human beings possess nine intelligences in varying degrees. Each individual has a different intelligence. It is believed that education can be improved by evaluating the intellectual abilities of students and organizing activities accordingly. Each mind occupies a different part of the brain. The nine minds can work together or independently of each other. These nine intelligences can define the human species. Intellectual abilities have their own characteristics. Not everyone has the same abilities. One or two abilities may be better than others, while others may be average. Students have their own strengths and weaknesses in terms of intellectual abilities. Gardner's research reflects this and has the advantage of being able to identify a student's more developed abilities while also providing direction on how to further develop and improve other intellectual abilities.

#### **Research question:**

- 1) What is the level of intellectual ability of the students?
- 2) What is the difference between the intellectual abilities of Mongolian and Chinese students?

**Research purpose:** The purpose of this study is to identify and compare the intellectual abilities of Mongolian and Chinese students using H. Gardner's test and investigate the possibility of using them in training.

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#### **Research objectives:**

- 1) Read and study the theoretical concepts related to the concept of students' intellectual abilities and differences
- 2) Organize and develop a study to detect the intellectual abilities of Mongolian and Chinese students using H. Gardner's test

**Scope of research:** A total of 633 students participated in our study, of which 217 (34.3%) were male, 416 (65.7%) were female, 288 (45.5%) were Mongolian, and 345 (54.5%) were Chinese.

Research object: Differences in students' intellectual abilities

Things to study: Intellectual ability of Mongolian and Chinese students

Research method:

- 1) Method of document analysis / To clarify theories and sources related to research/
- 2) Questionnaire method /Determining students' intellectual abilities/
- 3) Quantitative and qualitative processing methods / processing data and analyzing the results /

Limitations of the research work:

When choosing the scope of the study, Mongolian and Chinese teacher training university students were included.

#### 2. THEORETICAL BACKGROUND

#### 2.1 THEORETICAL BASIS

There is no concept of good or bad teaching strategies that take into account the differences of students, but only emphasize the organization of students' learning, while others focus on the quality of teaching. There are strategies such as development, action planning, and teamwork that promote diversity (Berliner, 1986). The experienced teacher used a variety of teaching strategies in accordance with the needs of the students.

Acknowledging differences is the first condition for students to learn differently. Therefore, it is necessary to provide students with opportunities to learn in a certain way. Also, it should be taken into account that at the beginning of the course, students' previous knowledge and learning abilities are different, that is, the starting point of all students is different. Therefore, in order to successfully organize educational activities, there is an urgent need to conduct research to clarify the situation of students. In Chapter 7 of Howard Gardner's Multiple Intelligences Theory and His Ideas On Promoting Creativity, researcher Hani Morgan (2020) states that Howard Gardner's theory of multiple intelligences is an important theory that reflects the different ways students learn and the need to provide instruction tailored to their needs. is confirmed. It has been reported that when students are provided with instruction tailored to their needs, they tend to learn more and stay engaged.

In their article Multiple Intelligences and Success in School Studies, researchers Roman Yavic and Irina Rotnitskyi (2021) argue that students are most effective when they learn in the classroom according to their dominant intelligence and learning style. It has been stated that combining learning styles with dominant intelligence improves student learning. Also, a case study was conducted among 158 seventh-grade students in an Israeli middle school in order to investigate

the relationship between dominant intelligence and academic achievement of middle school students according to Gardner's theory of complex intelligence. Studies have shown that differences in intelligence have an impact on academic achievement. Therefore, based on Howard Gardner's theory of comprehensive intellectual abilities, we studied the differences in student abilities between Mongolian and Chinese students.

Scientist Howard Gardner defined the human mind as a complex thing made up of independent special abilities. The human mind forms nine independent types (speech ability, logic-mathematical ability, spatial ability, musical ability, physical ability, interpersonal communication ability, human internal culture, self-management ability, ability to distinguish natural phenomena, existence ability). and each type is not necessarily developed uniformly in one person, and this is explained based on certain facts. Every teacher should try to discover and develop the intellectual development of his students in the process of teaching.

Language skills. A student with a more developed ability likes to read, write and speak eloquently, can easily determine various special places and dates, attracts people's attention, and speaks well.

*Competence in logical mathematics.* A student who has developed this ability is good at conducting experiments, finding reasons and relationships, making various calculations, solving complex problems, summarizing, processing, etc.

Spatial competence. He likes to draw, is good at drawing and decorating, and has good spatial orientation, geometry, and abstract representation skills.

Musical ability. He likes to sing, listen to music, and play.

Physical ability. He likes to control his body movements, he likes dance and sports, he likes to convey information through gestures and movements, he likes to hold and feel, he likes to move and find balance.

*Interpersonal communication skills*. A student with a more developed ability likes to be among many people, attracts attention, likes to join a group, persuades others, gets them to say something, calls for something, mediates, advises, helps friends, cooperates, talks and compares.

*Human internal culture and self-management skills.* It is characterized by the fact that a more developed student prefers to work alone rather than socializing with others, to be alone, to do what he likes, to approach problems with his own feelings and imagination, to perform things independently, to like solitary tasks, and to learn by self-management.

*The ability to distinguish natural phenomena*. Good ability to identify, classify and handle plants and animals and other objects in nature.

*Existential competence*. He has deep understandings and the ability to solve questions about human existence, such as the meaning of life, why we die, and how we got here.

Gardner's test to determine the development of intelligence not only identifies the more dominantly developed abilities of the students, but also reveals the weakly developed abilities, so the teacher should try to develop methods to support the appropriate abilities of the students and use suitable tools for them.

#### 2.2 THEORETICAL RESEARCH

Regarding Differentiated learning (Different learning- Differentiated instruction), SSU teacher Ch. Oyunbileg said, "remove barriers that limit the participation and success of all students,

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respect their different needs, abilities, and characteristics, and support their learning opportunities, flexible and diverse "There is a need to implement teaching methods with alternative methods," he said. Shi hai bao (2023) In his master's research project "Situational analysis of the differences in intellectual abilities of students", he identified the differences in learning and intellectual abilities of Mongolian and Chinese engineering students in order to conduct equal accessibility training for teachers and students, and to support students in their successful learning. advice has been developed.

Researcher B. Jadamba et al. (2022) developed methods and models that take into account the differences of students, all students have different learning styles and different learning styles, so they discovered their differences and developed methods and models to organize the training according to the differences.

Scientist Howard Gardner, in his work "Frames of mind" published in 1983, considered the human mind to be a complex thing made up of independent special abilities and defined the first seven mental abilities. He added the latter two competencies in Intelligence Reframed (1999). They create patterns with their own characteristics, and each ability is not necessarily developed uniformly in the same person, and this is explained based on certain facts.

#### 3. METHODS

#### Research methodology for determining students' intellectual abilities

H. Gardner's test with 108 questions in 9 chapters to determine the intellectual abilities of Mongolian and Chinese students (language, logic, mathematics, spatial, musical, physical movement, interpersonal relations, self-management of human culture, communication with nature, existence) within the framework of the research, the following studies were conducted, and quantitative and qualitative processing of research documents was carried out. It includes:

- 1) A questionnaire survey was organized to clarify the intellectual abilities of students.
- 2) The data was processed and the results were analyzed and processed quantitatively and qualitatively.

The survey was conducted online between September 11-21, 2023, with the localization version of B. Jadamba et al. translated into Chinese, and evaluated as yes-1 and no-0. A total of 633 students participated in the study, of which 217 (34.3%) were male, 416 (65.7%) were female, 288 (45.5%) were Mongolian, and 345 (54.5%) were Chinese. Examining the reliability of the survey questions, Cronbach's Alpha was .952. When processing the research results, SPSS 29 software was used to process summary statistics and the reliability of the questions was checked by Cronbach's Alpha using Reliability Statistics, as well as Independent Samples Test and ANOVA test to clarify whether there were statistically significant differences between the research questions in terms of gender, class, age, and two countries. methods were used. Correlation analysis was performed to estimate correlation between groups.

Table 1. The results of H. Gardner's reliability test for the sample included in the study

Intellectual competences	Cronbach's Alpha	N of Items
Linguistic Intelligence	0.745	12
Logical-Mathematical Intelligence	0.788	12
Musical Intelligence.	0.780	13
Visual-Spatial Intelligence	0.702	11
Bodily-Kinesthetic Intelligence	0.708	12
Intrapersonal Intelligence	0.639	11
Interpersonal Intelligence	0.719	12
Natural Intelligence	0.733	13
Existential Intelligence	0.659	12

Although the reliability of the study we conducted was confirmed, it was re-examined because it was translated into Chinese and included Chinese students. As seen in [Table 1], our research questions show high consistency.

#### Research scope information

Looking at the details of the students who participated in the study, the following results were obtained. A total of 633 students participated in the study, 217 (34.3%) were male students and 416 (65.7%) were female students. In addition, the majority of students are 2nd year students and 326 (51.5%), 1st year students 183 (28.9%), 3rd year students 78 (12.3%), and 4th year students 46 (7.3%) respectively. covered. Also, out of 633 students, 288 (45.5%) are Chinese and 345 (54.5%) are Mongolian students. In terms of age, 258 (40.8%) 19-year-old students, 116 (18.3%) 18-year-old students, 106 (16.7%) 20-year-old students, 143 (22.6%) 21-year-old students, and 10 (1.6%) 22-year-old students. was occupying

#### 4. Results, Data Analysis

#### 4.1 Development and results of research on students' intellectual competences

In order to clarify the intellectual abilities of students, the survey was organized with a total of 108 questions of 9 abilities (language, logic, mathematics, music, space, physical, human internal culture, self-management, interpersonal relations, interaction with nature, existence). The answer to the question was filled in as yes or no, and if the answer is yes, then the competence is better, and if the answer is no, the competence is weakly developed. The following results were obtained

for all Mongolian and Chinese students who participated in the study.

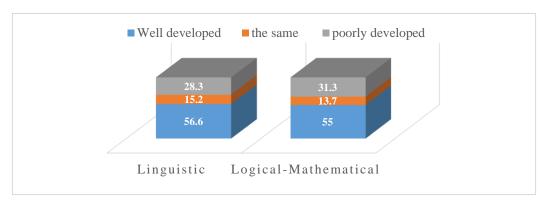


Figure 1. Students' linguistic and logical-mathematical competences

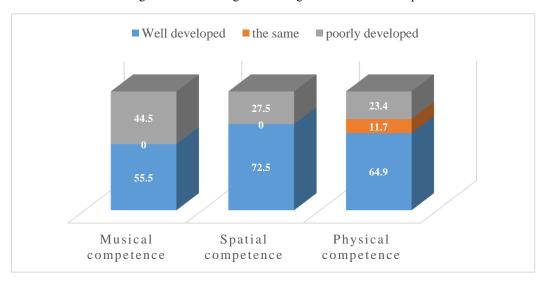


Figure 2. Musical, spatial and physical comptences of students

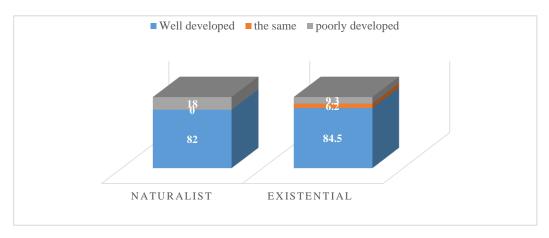


Figure 3. Students' internal human culture, self-management and interpersonal communication competences

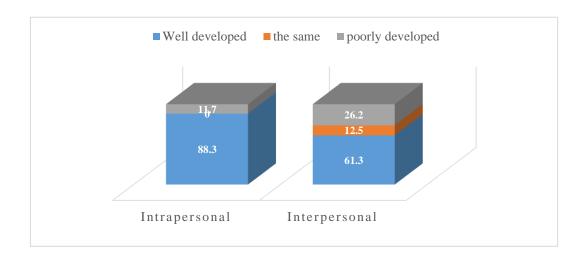


Figure 4. Students' ability to interact with nature and exist

As can be seen from the graphs above, not only are most of the students' abilities well developed, but for all the students involved in the study, the internal human culture self-management (88.3%), presence (84.5%), communication with nature (82%) competencies are relatively high, as well as spatial competencies (72.5%). physical (64.9%) and interpersonal communication (61.3%) abilities are reasonable, but language (56.6%), music (55.5%), and logical mathematics (55%) have weak results. From this, it can be concluded that today's students' self-concept prevails, they have a culture of self-management and coordinated communication, and they have the ability to live and adapt to the natural environment of society. [Table 2] shows that "Human internal culture and self-management competence" (m=1.88), "Nature interaction competence" (m=1.82), "Spatial competence" (m=1.73), and existential competence (m= 1.78), relatively high performance, "Language Competence" (m=1.41), "Logical Mathematical Competence" (m=1.41), and Interpersonal Communication Competence (m=1.49), relatively weak compared to other competencies.

Table 2. Results showing the average intellectual ability of Mongolian and Chinese students

Competences	N	Mean	Std. Deviation	
Linguistic Intelligence	633	1.41	0.739	
Logical-Mathematical Intelligence	633	1.41	0.720	
Musical Intelligence.	633	1.55	0.497	
Visual-Spatial Intelligence	633	1.73	0.447	
Bodily-Kinesthetic Intelligence	633	1.53	0.695	
Intrapersonal Intelligence	633	1.88	0.322	
Interpersonal Intelligence	633	1.49	0.707	
Naturalist Intelligence	633	1.82	0.385	
Existential Intelligence	633	1.78	0.542	

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Table 3. The calculation of gender differences in students' intellectual ability

Intellectual competences	sex	N	Mean	Std. Deviation	sig
Linguistic Intelligence	male	217	1.43	0.743	
Logical-Mathematical Intelligence	female	416	1.41	0.739	0.961
Musical Intelligence.	male	217	1.53	0.694	0.120
Visual-Spatial Intelligence	female	416	1.35	0.727	0.128
Bodily-Kinesthetic Intelligence	male	217	1.63	0.485	0.000
Intrapersonal Intelligence	female	416	1.52	0.500	0.000
Interpersonal Intelligence	male	217	1.72	0.448	0.896
Naturalist Intelligence	female	416	1.73	0.447	
Existential Intelligence	male	217	1.66	0.647	0.000
Linguistic Intelligence	female	416	1.46	0.710	
Logical-Mathematical	male	217	1.85	0.355	
Intelligence Musical Intelligence.	female	416	1.90	0.302	0.001
Visual-Spatial Intelligence	male	217	1.57	0.650	0.001
Bodily-Kinesthetic Intelligence	female	416	1.44	0.733	
Intrapersonal Intelligence	male	217	1.81	0.396	0.208
Interpersonal Intelligence	female	416	1.83	0.379	0.208
Naturalist Intelligence	male	217	1.76	0.557	0.260
	female	416	1.79	0.534	0.268

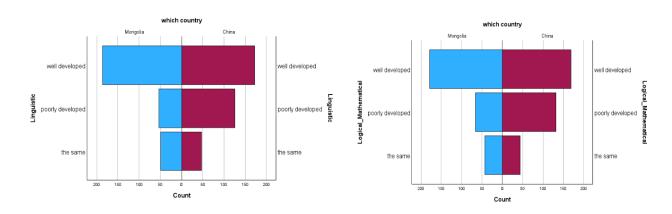
As can be seen from [Table 3], there are statistically significant differences in "Musical Competence", "Physical Competence", "Internal Culture and Self-Management Competence", and "Interpersonal Communication Competence". However, no statistically significant differences were observed for other competencies. Male students have higher musical, physical, and interpersonal skills than female students, and female students have higher internal culture and self-management skills.

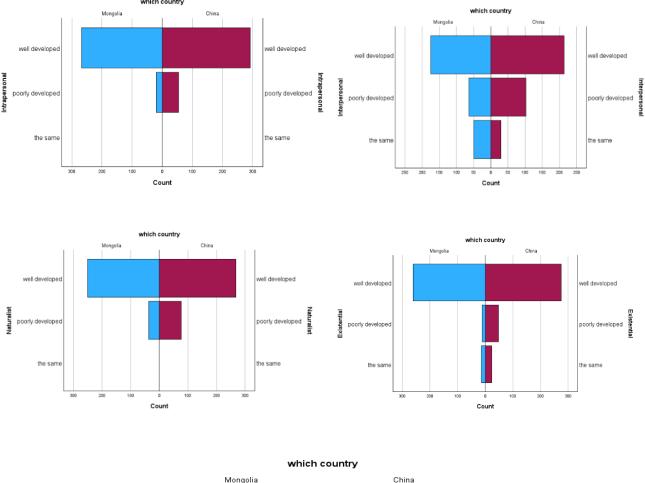
[Table 4] shows that Mongolian and Chinese students have statistically significant differences in "Musical Competence", "Human Inner Culture Self-Management Competence", "Interpersonal Communication Competence", "Environmental Competence" and Existence Competence. For example, Chinese students have higher musical ability and interpersonal communication skills compared to Mongolian students, but Mongolian students have higher human inner culture self-management skills, nature interaction skills, and existential skills. In addition, it was seen that although the intellectual ability of students increases as the course progresses, the performance of fourth-year students is relatively low compared to others. This may be due to the relatively small number of 4th graders in our study sample. Examining the relationship between the 9 intellectual abilities shows a strong correlation with statistical significance.

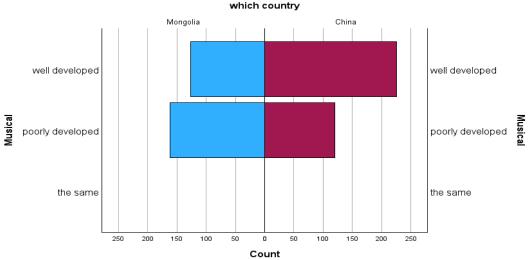
Table 4. Calculated whether there is a difference in the intellectual ability of Mongolian and Chinese students

Intellectual competences	Gender	N	Mean	Std. Deviation	sig
Linguistic Intelligence	Mongolian	288	1.48	0.769	0.125
Logical-Mathematical Intelligence	Chinese	345	1.36	0.711	
Musical Intelligence.	Mongolian	288	1.47	0.741	0.229
Visual-Spatial Intelligence	Chinese	345	1.36	0.698	
Bodily-Kinesthetic Intelligence	Mongolian	288	1.44	0.497	0.001
Intrapersonal Intelligence	Chinese	345	1.65	0.477	0.001
Interpersonal Intelligence	Mongolian	288	1.74	0.438	0.064
Naturalist Intelligence	Chinese	345	1.71	0.454	
Existential Intelligence	Mongolian	288	1.54	0.707	0.712
Linguistic Intelligence	Chinese	345	1.53	0.686	
Logical-Mathematical Intelligence	Mongolian	288	1.93	0.255	0.001
Musical Intelligence.	Chinese	345	1.84	0.364	
Visual-Spatial Intelligence	Mongolian	288	1.44	0.767	0.001
Bodily-Kinesthetic Intelligence	Chinese	345	1.53	0.651	
Intrapersonal Intelligence	Mongolian	288	1.87	0.335	0.001
Interpersonal Intelligence	Chinese	345	1.78	0.417	
Naturalist Intelligence	Mongolian	288	1.85	0.47	0.001
	Chinese	345	1.72	0.58	

Figure 5-13. Ratio of intellectual abilities of students in Mongolia and China







As can be seen from the pictures above, the intellectual ability of Mongolian and Chinese students is relatively similar, and the musical ability of Chinese students is high.

#### 5. CONCLUSION

The research to determine students' intellectual ability was taken from 633 students of universities in Mongolia and China using Gardner's questionnaire to determine intellectual ability, and statistical analysis was conducted.

According to Howard Gardner's intellectual ability questionnaire, most of the students' abilities are superior, but also the existence, interaction with nature, human inner culture, and self-management abilities are relatively highly developed. It turns out that there is a slight advantage in language, logical mathematics, and musical abilities.

Mongolian and Chinese students have statistically significant differences in "Musical Competence", "Human Internal Culture Self-Management Competence", "Interpersonal Communication Competence", "Nature Communication Competence" and Existence Competence. Although Chinese students have higher musical ability and interpersonal communication skills compared to Mongolian students, Mongolian students show higher human inner culture self-management ability, ability to interact with nature, and existence ability.

In addition, it was seen that although the intellectual ability of students increases as the course progresses, the performance of fourth-year students is relatively low compared to others. This may be due to the relatively small number of 4th graders in our study sample. Examining the relationship between the 9 intellectual abilities shows a strong correlation with statistical significance.

#### Recommendations for the development of students' intellectual competences

Modern learners have different needs, interests and intellectual abilities. Improving Learning Outcomes Teachers need to study the differences of their students and implement appropriate methodologies. Based on the results of the survey of 633 students with 108 questions of H. Gardner's nine groups, we offer the following recommendations to further improve the good and more developed intellectual abilities of students. It includes:

#### Linguistic Intelligence:

Teachers can improve their language and speaking skills by having students journal, complete word networks, and engage in conversation. Advice, videos, series of lectures by people with good oratory skills such as poets, writers, lawyers, etc. It is also appropriate to do activities such as writing articles, speaking, preparing television and radio programs, creating magazines, participating in discussions and debates, playing word puzzles, preparing business advertisements, etc.

#### Logical-Mathematical Intelligence:

Teachers can improve students' intellectual abilities by teaching computer programming languages, developing critical thinking skills, using Piaget's cognitive exercises, science fiction scenarios, logic puzzles, putting things in the correct order according to patterns, and working with special instructions. Also, it is good to have activities such as solving problems based on logical thinking, solving puzzles, predicting results based on various situations, solving logical tasks, making business plans based on imagination, etc.

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#### Visual-Spatial Intelligence:

Teachers can develop this intelligence through the use of graphs, charts, diagrams, graphs, videos, artwork, the use of paints, microscopes, computer graphics, and various software. In addition, it is appropriate for the teacher to have students with developed spatial skills perform the following activities. For example, it is necessary to participate in artistic activities such as drawing and playing, reading maps, creating and thinking using pictures.

#### **Bodily-Kinaesthetic Intelligence:**

Teachers can support and develop this cognitive ability using touch, feel, movement, exercise, rotation, permission to move, facial expressions, and physical and relaxation exercises. Also, it is optimal to have the following activities done by students who have developed physical movement skills. Literary and historical things and phenomena should be expressed through body movements and drama performances, and in addition to using the main parts of the body to measure things, attention should also be paid to coordinating body movements when speaking. Also, it is good to pay attention to learning from folk dances that express different cultures and making architectural and building models using simple tools.

#### Musical Intelligence.:

Teachers can use activities to encourage students' musical intelligence in their lessons by assigning them tasks such as playing music in the classroom and writing lyrics about the material being taught. In addition, it is necessary to practice not only writing and reading poetry, but also expressing literary and historical things and phenomena through dance and movement, and expressing mathematical concepts and concepts through music.

#### Interpersonal Intelligence:

Teachers can increase their students' interpersonal intelligence by organizing their lessons by dividing them into teams, working in groups, and planning cooperative learning activities. In addition, it is optimal for students who have developed interpersonal communication skills to do the following activities. Pay attention to teamwork, giving advice to others, cooperation, organizing interviews.

#### Intrapersonal Intelligence:

Teachers should provide more reflective activities such as journaling, organizing, and writing essays to develop students' inner intelligence. An individual must use his other intelligence to fully express his inner intelligence. Also, it is appropriate for students who have developed internal human culture and self-management skills to do the following activities. This includes working independently, writing essays, reflections, autobiographies, stories, and journaling.

#### Naturalist Intelligence:

Teachers can develop and support this intelligence in their students by comparing species and groups of plants and animals, exploring the relationships between systems, and the connections and functions of scientific problems. In addition, it is optimal for students who have developed the ability to interact with nature to do the following activities. Collecting interesting things from nature, classifying and systematizing natural phenomena, traveling and enjoying nature, as well as solving mathematical problems by imagining plants and animals.

#### Existential Intelligence

It can be developed by listening to lectures, reading books, doing speaking exercises, etc., to develop the ability to take a position on the existential features of the cosmos and the human

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condition, such as the meaning of life and death, the ultimate fate of the physical and psychological worlds.

It is optimal for students who have developed existential intelligence to do the following activities. This includes reading various philosophical books, reading and studying works written by philosophical thinkers and explaining them to other students, as well as writing essays and articles about life and its meaning.

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