

CAT4

The results of the pilot testing of students of Astana PM Intellectual school on cognitive ability test

BACKGROUND

1. Starting from 2013, the student selection to is conducted under the new system, which was developed in cooperation with strategic partners Cito (Netherlands) and CTY (USA).
2. The system includes an assessment of the ability to operate with figures, numbers and assessment of spatial abilities.
3. Question: Are the new selection system valid?

The school teachers survey:

Teacher who teach students selected under the new system, highlighted the following features in comparison with other students:

- Students are able to search for information independently
- Students are able to determine the sequence of actions during problem solving
- They offer unusual ways and approaches during problem solving, especially when it is related to difficult tasks
- They prefer non typical tasks, which demands logical and abstract logical thinking
- They need a minimum consultancy support from the teacher during the lessons

How we can validate it using a standardised test?



Cognitive ability test fourth edition (CAT4)

Aim: to assess a student's reasoning (thinking) abilities in key areas that support educational development and academic attainment.

Test characteristics

CAT4 is the fourth edition of the test and comprises the following sections or batteries which assess different aspects of ability:

- Quantitative Reasoning (the ability to operate with numbers);
- Verbal Reasoning (reading, verbal analogies);
- Non-verbal Reasoning (figures classification, figure matrices);
- Spatial Ability (thinking with shape and space).

Users: GL Assessment has delivered over 6 million online tests to date in more than 100 countries around the world.

Test developer company: GL –ASSESSMENT, Oxford, UK

For over 30 years, we have provided assessments for children's education, mental health and wellbeing.

Participants

Grades	Количество участников тестирования		
	Total number	Kazakh language of instruction	Russian language of instruction
8*	64	44	20
10	149	86	63

* The 8 grade students were selected by the new selection system

Skills	Domains	Number of items	Time
Verbal Reasoning	Verbal classification	22	8 min.
	Verbal analogies	20	8 min.
Quantitative (or Numerical) Reasoning	Number Analogies	20	10 min.
	Number Series	22	8 min.
Non-verbal Reasoning	Figure Classification	22	10 min.
	Figure Matrices	20	10 min.
Spatial Ability	Figure Analysis	22	9 min.
	Figure Recognition	20	9 min.

VERBAL REASONING

Verbal classification

Three words are presented which are similar in some way or ways. From a selection of five possible answers, the student must identify a fourth word with similar properties.
The answer is snow because rain, fog and sunshine are all types of weather and snow is also a type of weather.

rain fog sunshine

winter snow weather dark night

Verbal analogies

A pair of connected words is presented alongside a single word. From a selection of five possible answers, the student must select a word to complete the second pair in the same way.
The answer is window, because a carpet goes on a floor and a curtain hangs at a window.

carpet---> floor; curtain --->

window shade hang drapes cloth

QUANTITATIVE REASONING

Number Analogies

Two pairs of related numbers are presented. From a selection of five possible answers, the student must select a number to complete a third pair.
The answer is 8. Here 1 add 1 makes 2, but that doesn't work for the second pair because 5 add 1 is 6, not 10. Instead, you have to multiply by 2 to get the second part of each pair, so 4 times 2 is 8.

(1--->2); (5--->10); (4--->?)

5 7 8 9 10

Number Series

A sequence of numbers created by a transformation rule is presented. From a selection of five possible answers, the student must identify the rule and continue the sequence.
The answer is 15. There are two number patterns in this series. The first, third and fifth numbers go down by 1 at a time – 18, 17 then 16. The numbers in between them go up by two at a time – 5, 7 then 9. This means the next number must be 16 minus 1, giving 15.

18 5 17 7 16 9 ---->

11 12 13 14 15

EXAMPLES OF ITEMS

NON-VERBAL REASONING

Figure Classification

Three designs are presented which are similar in some way or ways. From a selection of five possible answers, the student must identify a fourth design with similar properties.

The answer is E because it is the only answer choice that is a striped semi-circle, like the first three figures.

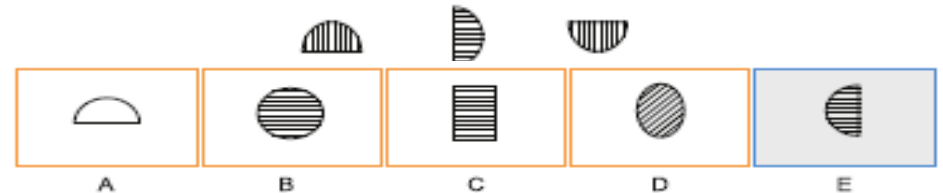
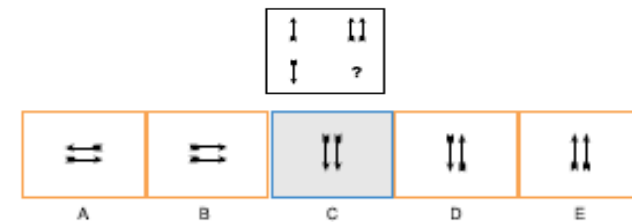


Figure Matrices

Designs are presented in a grid with one empty square and, from a selection of five possible answers, the student must identify the missing design.

The answer is C because in the top pair 'one arrow up' goes to 'two arrows up', so in the second pair 'one arrow down' must go to 'two arrows down'.



SPATIAL ABILITY

Figure Analysis

series of diagrams shows a square being folded repeatedly, and then punched through with holes. From a selection of five possible answers, the student must identify how the paper will appear when unfolded.

The answer is D. The hole is punched through both layers of paper, so as it is unfolded the holes will be a mirror image of each other, with the crease being the mirror line.

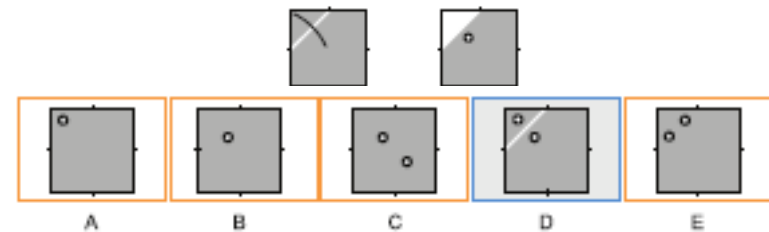
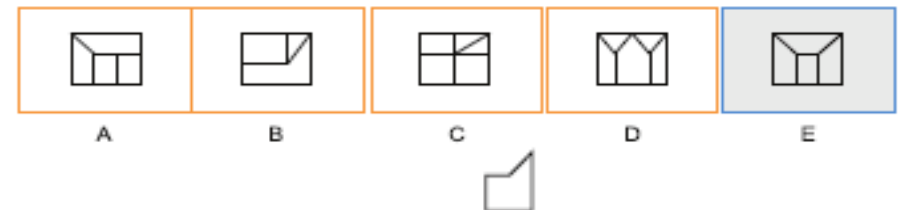


Figure Recognition

Several complex designs are presented along with a single target shape. From a selection of five possible answers, the student must identify the target shape within one of the complex designs.

The answer is E. It isn't A because that shows the target flipped over. It isn't B or C because they have shapes that are the wrong size.



THE RESULT OF GRADE 8 STUDENTS

The table below shows mean (average) scores for your group compared with those for the national sample.

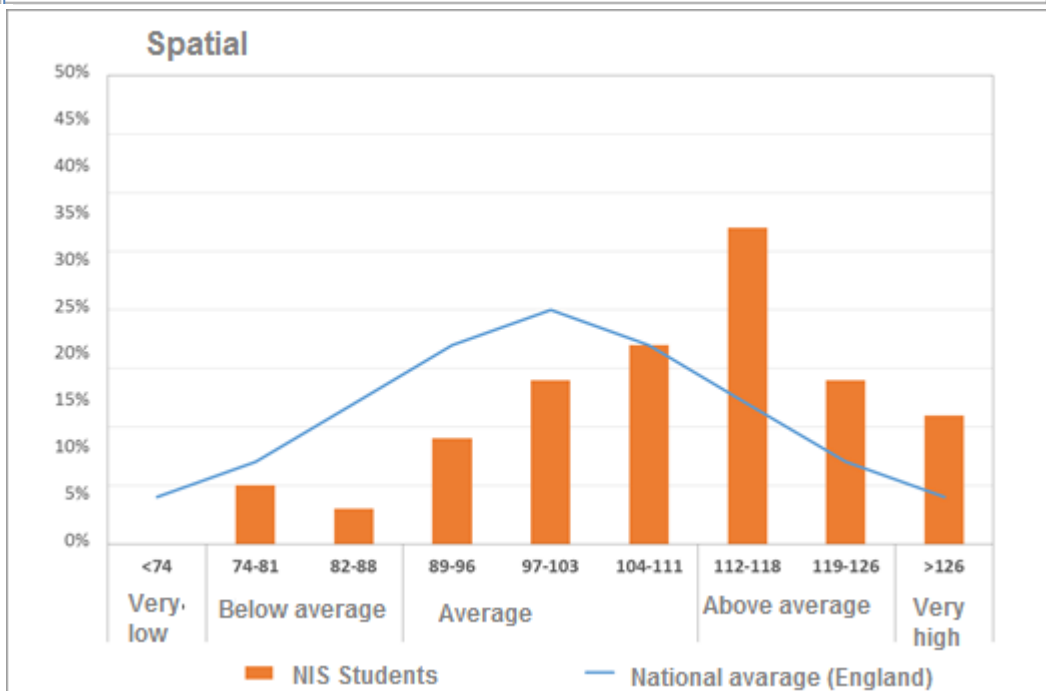
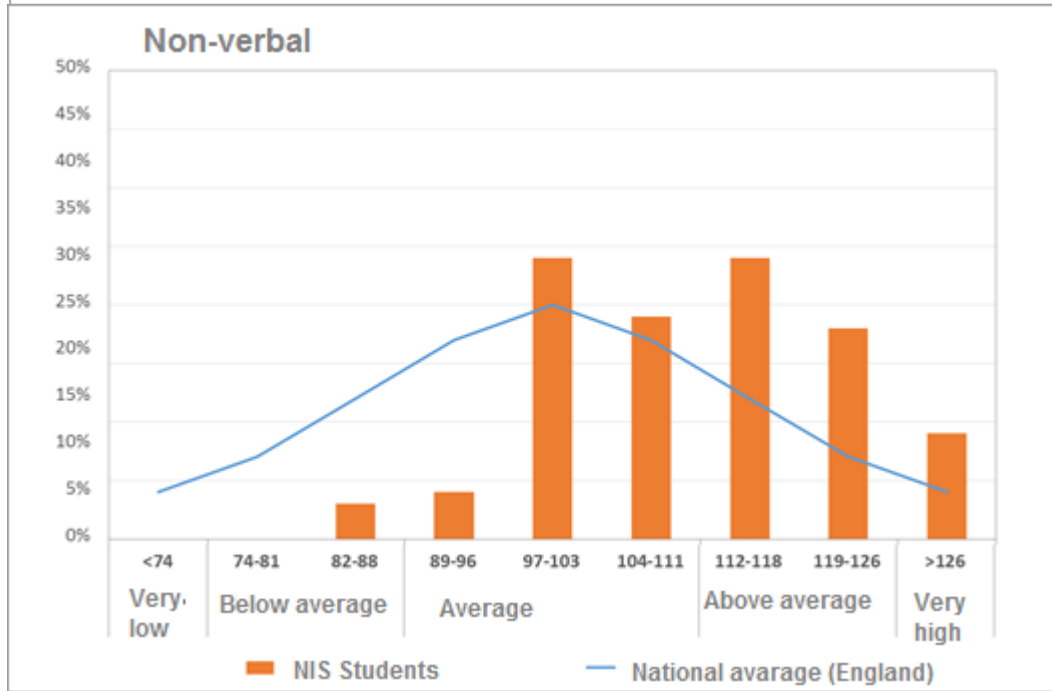
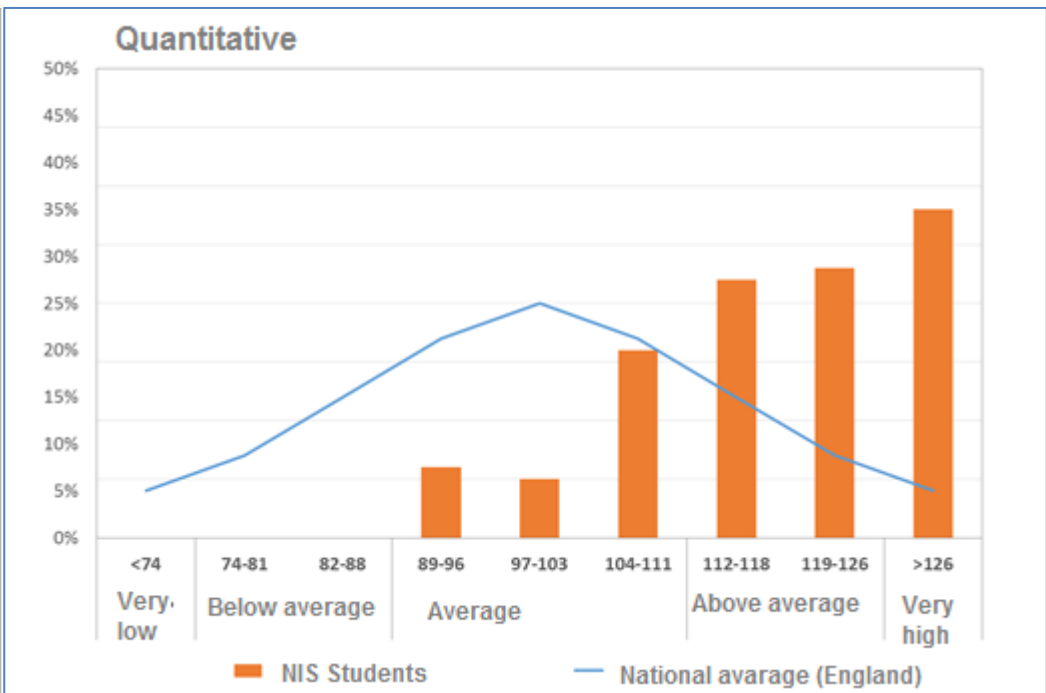
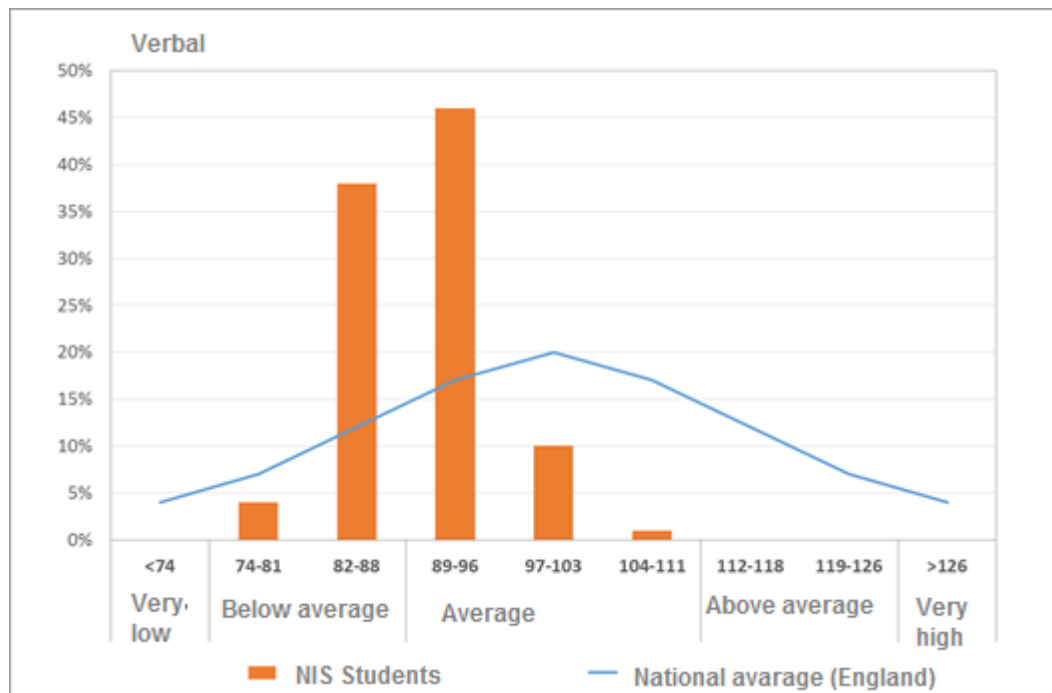
Sample	Verbal	Quantitative	Non-verbal	Spatial	Total
National average of England	100	100	100	100	100
The average score of students of Intellectual school	89,7	118,8	110,6	109,7	106,9

The table below shows the distribution of scores for your group compared with those for the national sample of England.

Description	Очень низко	Ниже среднего		Среднее			Выше среднего		Очень высоко
		74-81	82-88	89-96	97-103	104-111	112-118	119-126	
SAS bands	<74	74-81	82-88	89-96	97-103	104-111	112-118	119-126	>126
National average (England)	4%	7%	12%	17%	20%	17%	12%	7%	4%
NIS students: Verbal	0%	4%	38%	46%	10%	1%	0%	0%	0%
Учащиеся НИШ: Quantitative	0%	0%	0%	6%	5%	16%	22%	23%	28%
Учащиеся НИШ: Non-verbal	0%	0%	3%	4%	24%	19%	24%	18%	9%
Учащиеся НИШ: Spatial	0%	5%	3%	9%	14%	17%	27%	14%	11%

* The national average is calculated based on results of 25,000 students of particular age group

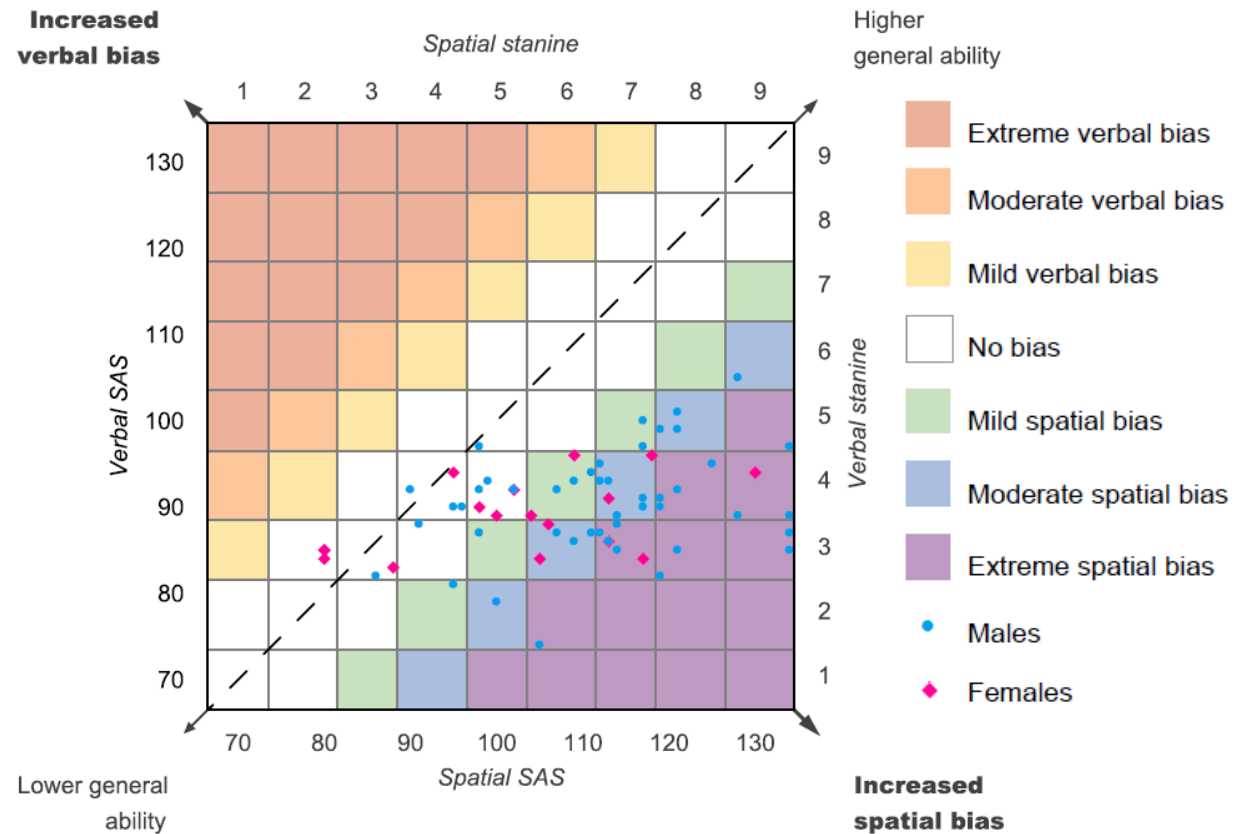
THE DISTRIBUTION OF THE RESULTS OF 8 GRADE STUDENTS



8 GRADE STUDENTS PROFILES

The analysis of CAT4 scores allows all students to be assigned a profile; that is they are assigned to one of seven broad descriptions of their preferences for learning. The Verbal Reasoning and Spatial Ability. Batteries form the basis of this analysis and the profiles are expressed as a mild, moderate or extreme bias for verbal or spatial learning or, where no bias is discernable (that is, when scores on both batteries are similar), as an even profile.

Description	In England (sample)	NIS
Extreme verbal bias	2%	0%
Moderate verbal bias	4%	0%
Mild verbal bias	11%	0%
No bias	66%	27%
Mild spatial bias	11%	14%
Moderate spatial bias	4%	28%
Extreme spatial bias	2%	31%



THE RESULT OF GRADE 10 STUDENTS

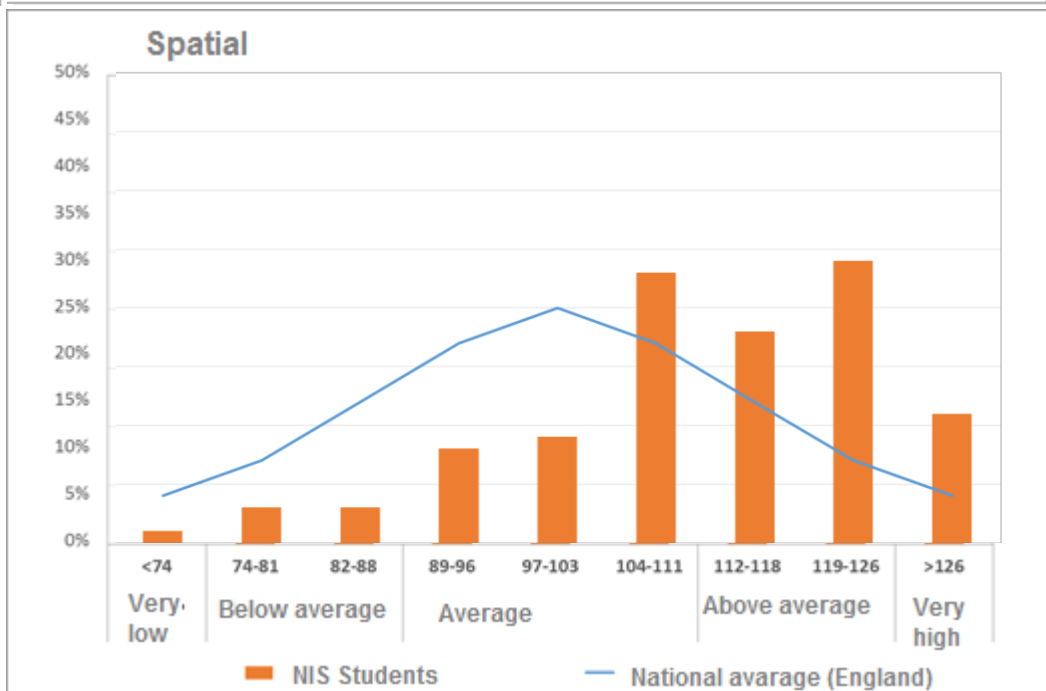
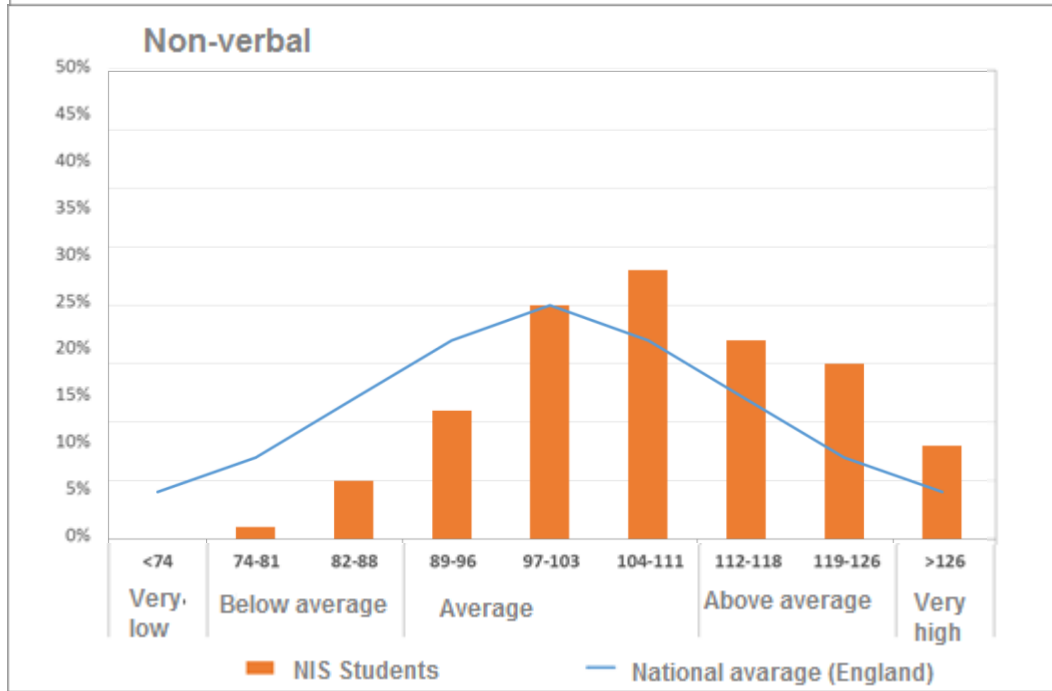
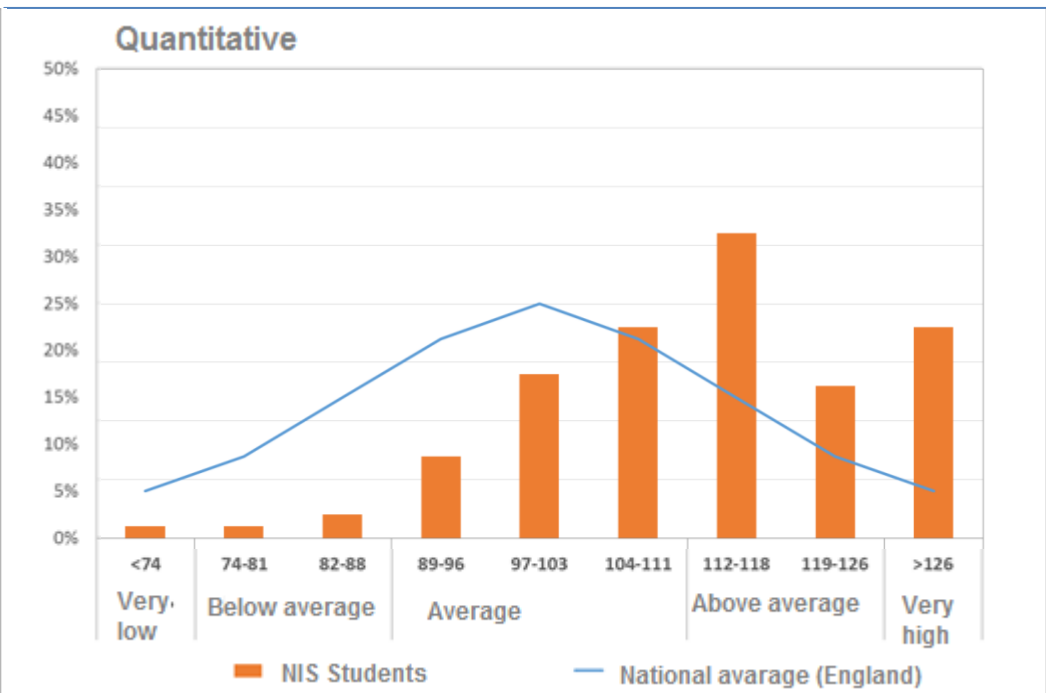
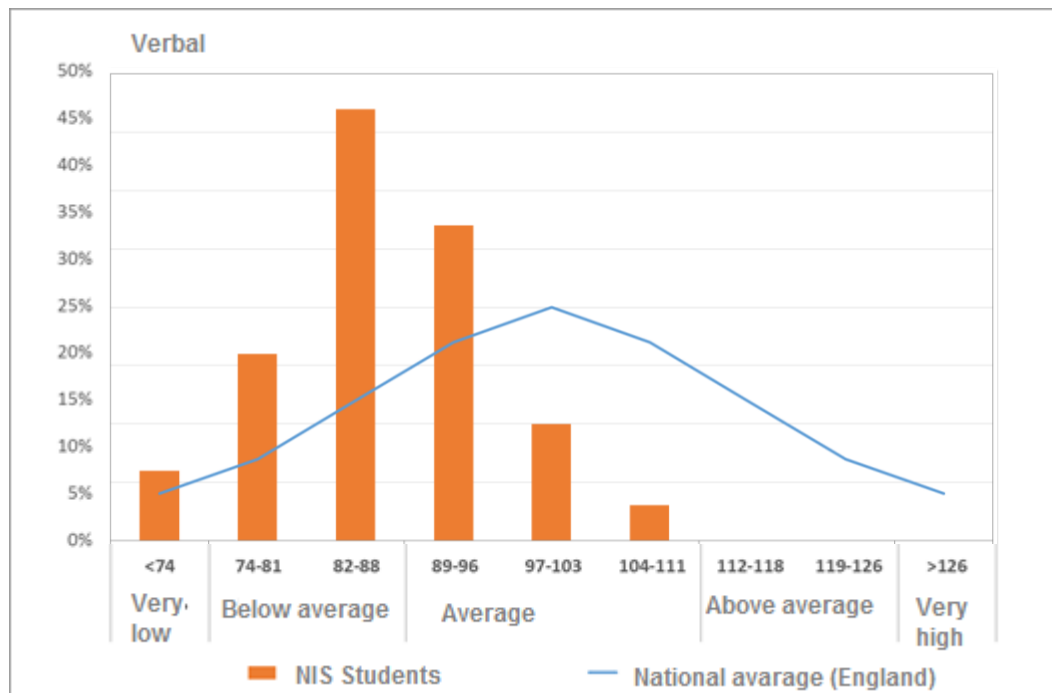
The table below shows mean (average) scores for your group compared with those for the national sample.

Sample	Verbal	Quantitative	Non-verbal	Spatial	Total
National average of England	100	100	100	100	100
The average score of students of Intellectual school	86,8	113,2	108,2	111,8	104,8

The table below shows the distribution of scores for your group compared with those for the national sample of England.

Description	Very low	Below average		Average			Above average		Very high
		74-81	82-88	89-96	97-103	104-111	112-118	119-126	
SAS bands	<74	74-81	82-88	89-96	97-103	104-111	112-118	119-126	>126
National average (England)	4%	7%	12%	17%	20%	17%	12%	7%	4%
NIS students: Verbal	6%	16%	37%	27%	10%	3%	0%	0%	0%
Учащиеся НИШ: Quantitative	1%	1%	2%	7%	14%	18%	27%	13%	18%
Учащиеся НИШ: Non-verbal	0%	1%	5%	11%	20%	23%	17%	15%	8%
Учащиеся НИШ: Spatial	1%	3%	3%	8%	9%	23%	18%	24%	11%

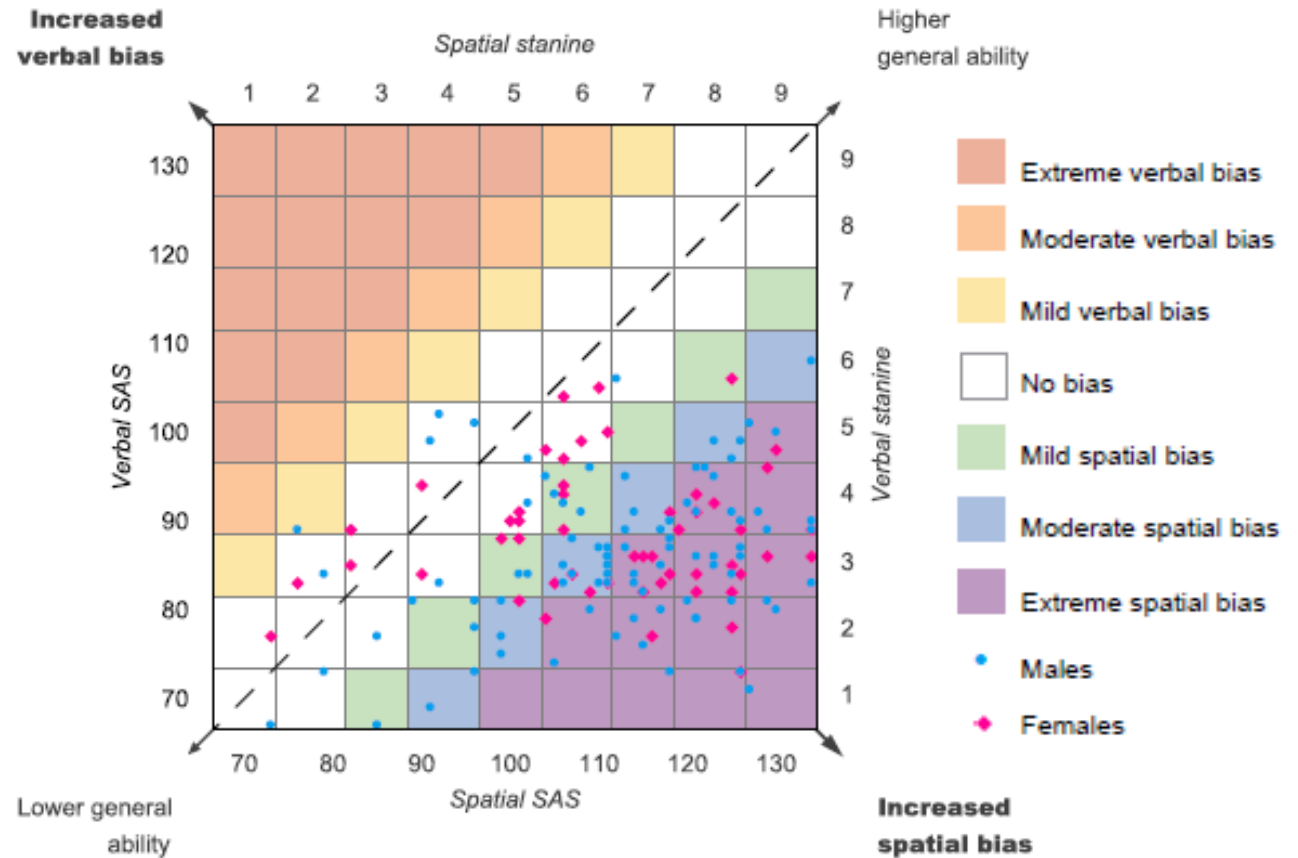
THE DISTRIBUTION OF THE RESULTS OF 10 GRADE STUDENTS



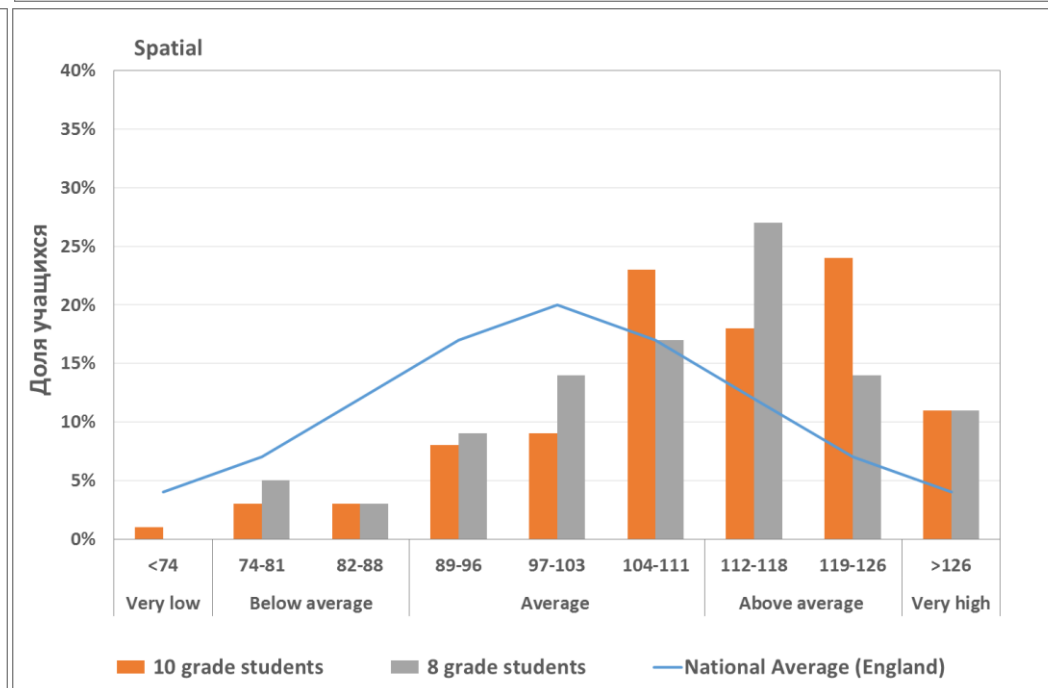
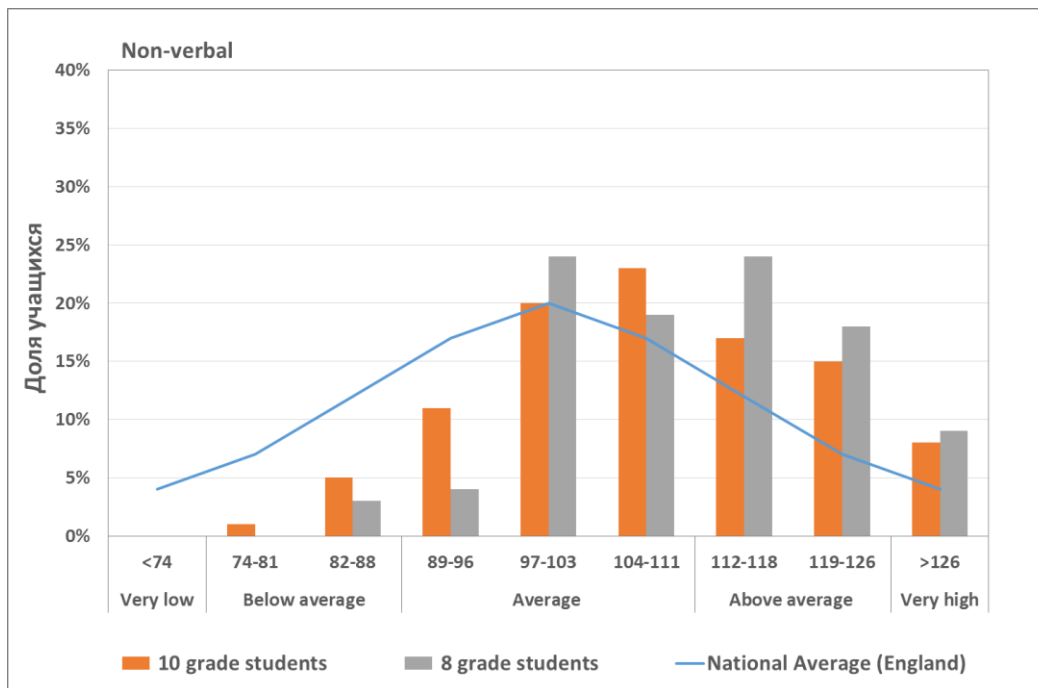
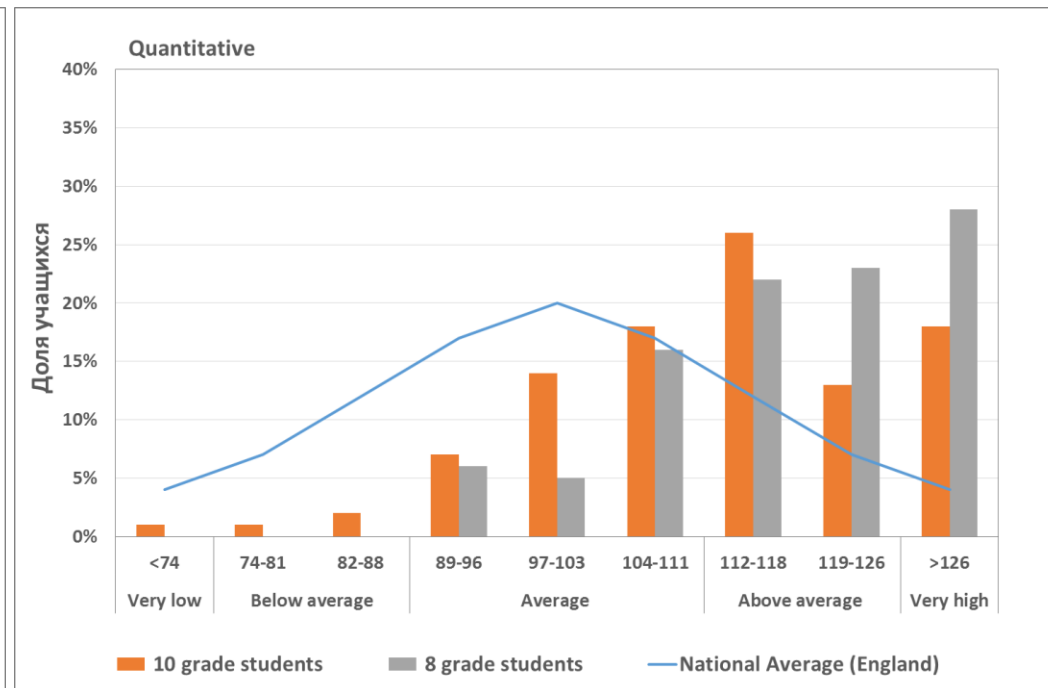
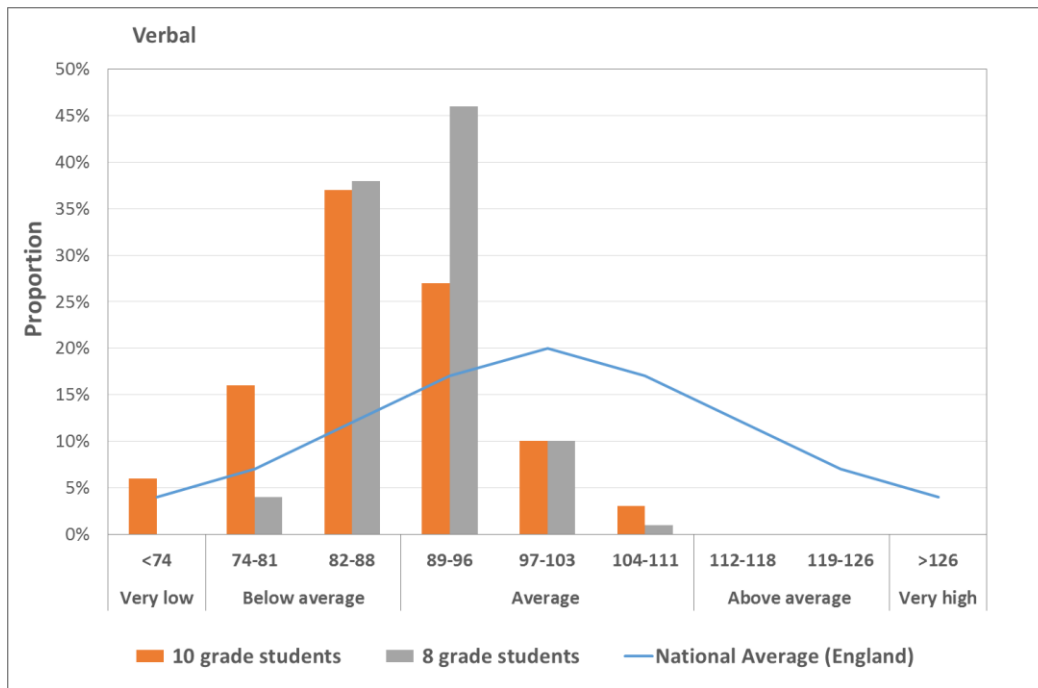
10 GRADE STUDENTS PROFILES

The analysis of CAT4 scores allows all students to be assigned a profile; that is they are assigned to one of seven broad descriptions of their preferences for learning. The Verbal Reasoning and Spatial Ability. Batteries form the basis of this analysis and the profiles are expressed as a mild, moderate or extreme bias for verbal or spatial learning or, where no bias is discernable (that is, when scores on both batteries are similar), as an even profile.

Description	In England (sample)	NIS
Extreme verbal bias	2%	0%
Moderate verbal bias	4%	0%
Mild verbal bias	11%	1%
No bias	66%	18%
Mild spatial bias	11%	12%
Moderate spatial bias	4%	22%
Extreme spatial bias	2%	47%



Результаты учащихся 8 и 10 классов



The distribution of students by abilities

Description	Characteristics	Number of students	
		8	10
Extreme verbal bias	<ul style="list-style-type: none"> •These students should excel in written work and should enjoy discussion and debate. •They should prefer to learn through reading, writing and may be very competent independent learners. •They are likely to be high achievers in subjects that require good verbal skills such as English, modern foreign languages and humanities. •They may prefer to learn step-by-step, building on prior knowledge, as their spatial skills are relatively weaker, •being in the low average or below average range. 	0	0
Moderate verbal bias	<ul style="list-style-type: none"> •Students in this group will have average to high scores for Verbal Reasoning and relatively weaker Spatial Ability •with scores in the average range. •These students are likely to prefer to learn through reading, writing and discussion. •Step-by-step learning, which builds on prior knowledge incrementally, is likely to suit these students. 	0	0
Mild verbal bias	<ul style="list-style-type: none"> •Some students with this profile will have low average or below average scores for Verbal Reasoning and relatively •weaker Spatial Ability, but the gap between scores will be narrow. •A slight bias for learning through reading, writing and discussion may be discerned in the students in this group. 	0	1
No bias	<ul style="list-style-type: none"> •Scores for students with this profile will be very similar for both Verbal Reasoning and Spatial Ability but will be across the range from low to high. •Students with high even scores will excel across the curriculum and will learn through the range of media and methods. •Students with low even scores, conversely, may require significant levels of support to access the curriculum but will be open to a range of teaching and learning methods. 	17	26
Mild spatial bias	<ul style="list-style-type: none"> •Some students with this profile will have low average or below average scores for Spatial Ability and relatively weaker Verbal Reasoning skills, but the gap between scores will be narrow. •A slight bias for learning through visual media may be discerned in the students in this group. 	9	17
Moderate spatial bias	<ul style="list-style-type: none"> • Students in this group will have average to high scores for Spatial Ability and relatively weaker Verbal Reasoning with scores in the average range. • These students are likely to prefer to learn through visual and kinaesthetic media and will need to use diagrams, pictures, videos and objects to learn best. • Students with above average or high Spatial Ability are often characterised as ‘intuitive’ or ‘big picture’ learners: attention to detail may be a weakness. • Owing to a relative weakness in verbal skills, attainment may be uneven and they are likely to need support in • subjects where the emphasis is on the written word. 	18	32
Extreme spatial bias	<ul style="list-style-type: none"> • These students should excel in problem solving and will grasp concepts quickly and intuitively. •They will not enjoy rote learning and may arrive at a correct solution to a task without demonstrating the steps along the way. •They are likely to be high achievers in subjects that require good visual-spatial skills such as maths, physics and technology. • Owing to a relative weakness in verbal skills, attainment may be uneven and they may need support in subjects where the emphasis is on the written word. 	20	67

Результаты учащихся 8 и 10 классов

Description	National sample (England)	NIS		
		Grade 10	Grade 8	
			CAT4	CTY
Extreme verbal bias	2%	0%	0%	
Moderate verbal bias	4%	0%	0%	
Mild verbal bias	11%	1%	0%	
No bias	66%	18%	27%	6 – ‘super’ students 13 students of group II
Mild spatial bias	11%	12%	14%	5 - ‘super’ students 4 students of group II
Moderate spatial bias	4%	22%	28%	8- ‘super’ students 10 students of group II
Extreme spatial bias	2%	47%	31%	10- ‘super’ students 6 - students of group II 1 - students of group III

Recommendations example (10 grade student, distinct preference for spatial)

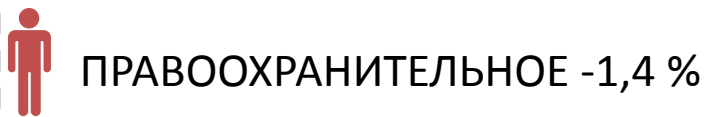
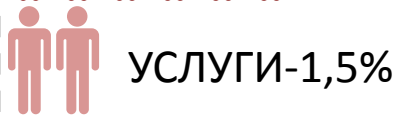
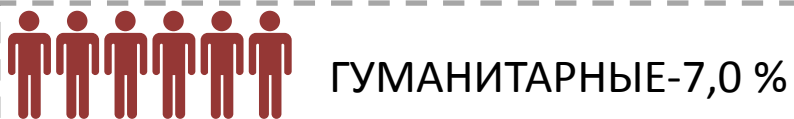
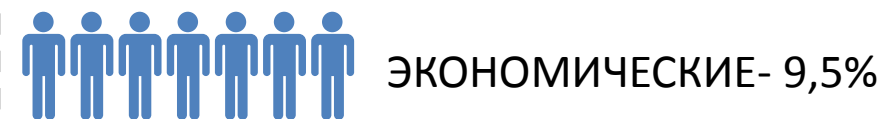
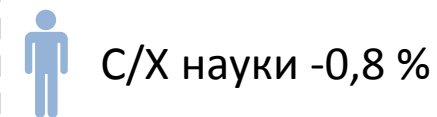
Summary	For teacher	For student	For parent
<p>This profile demonstrates a distinct preference for spatial over verbal learning. Nagima should perform at a high level when engaged in tasks that require visualisation and will learn quickly when working with pictures, diagrams, 3D objects, mind maps and other tangible methods.</p> <p>Weak verbal skills will make learning through written texts, writing and discussion more difficult and may impede progress even in subjects where spatial skills predominate.</p> <p>Nagima is highly likely to enjoy and learn best through active learning methods such as modelling, demonstrating and simulations. She should be encouraged to problem solve and develop her own ideas through these methods.</p> <p>She is likely to be high achievers in subjects that require good visual-spatial skills such as maths, physics and technology.</p> <ul style="list-style-type: none"> Owing to a relative weakness in verbal skills, attainment may be uneven and they may need support in subjects where the emphasis is on the written word. <p>However, she is likely to need support when engaging with written material.</p> <p>Final grades : English language - 5 , History -5</p>	<ul style="list-style-type: none"> Nagima should do very well in subjects that make the most of her spatial ability such as science, technology, design and geography but will find language-based subjects such as English, humanities, history and modern foreign languages difficult unless teaching methods are adapted to suit her profile. Nagima has a very well-developed understanding of spatial concepts but has below average verbal reasoning skills. Further investigation of this weakness would be beneficial through a test to establish Nagima's reading age or to identify a literacy learning difficulty. As a lack of attention to detail in those with high level spatial skills is often apparent, it is important that this and issues associated with poor literacy are addressed quickly. An aversion to rote or sequential learning may mean that intervention has to be clearly tailored to match Nagima's strengths – kinaesthetic, picture-based and multi-sensory. Nagima should be encouraged to explain her understanding of spatial activities and reflect critically upon them to develop her verbal reasoning skills. Placing Nagima in paired work with others, perhaps those with high level verbal skills, could provide mutual benefits. 	<p>Your profile of scores from CAT4 shows you have a strong preference for learning by using pictures, diagrams and other visual ways of learning rather than by reading, writing and discussion.</p> <p>You may find much of your schoolwork difficult, particularly subjects where you need to read and write a lot.</p> <ul style="list-style-type: none"> Do you find reading difficult? If so, you may need some extra help working one-to-one with a teacher. Make sure you understand what you are learning, step-by-step, as it is important for you to learn at a pace that is right for you. Always ask your teacher to explain anything that is not clear. However, you have very good spatial skills and these will help in very many subjects. Do you find maths difficult but do well in some areas such as geometry? Do you like solving problems when these are presented using diagrams, charts and pictures? <p>Final score on math – 5</p> <p>Make sure you use a range of ways to help you learn best such as texts supported with lots of pictures, videos, photos and examples from the world around you.</p> <ul style="list-style-type: none"> Make notes and revise using mind maps, marking notes and comments on texts and creating your own diagrams with pictures or images as reference points. You may find colour coding notes and texts useful. <p>When reading, scan a text first to take in headings, diagrams and illustrations. This will give you an overview of what you are about to read and learn.</p>	<p>Nagima's profile of scores from CAT4 shows she has a strong preference for learning in visual, practical ways with a weakness in verbal skills that may lead to difficulties in literacy.</p> <ul style="list-style-type: none"> Nagima may find some of her schoolwork difficult. <p>Does Nagima find reading difficult? If so, she may need some extra help with reading at home under guidance from school.</p> <p>Information from tutor: She was very modest until 9th grade, chemistry is the most difficult subjects.</p> <p>When you are helping with homework, make sure that Nagima understands each step of the task before moving on. It is important that Nagima learns at a pace that is right for her.</p> <ul style="list-style-type: none"> Nagima may see the solution to a problem quickly but be unable to talk through the steps needed to reach the answer. Make sure she is helped to explain how she has worked this out. Tell Nagima to ask the teacher to explain anything that is not clear. Encourage Nagima to use a range of ways to learn and revise, but focus on making mind maps, using pictures, charts and diagrams and using visual clues to

Выводы по тесту

- ✓ Результаты учащихся 8 и 10 классов школы ФМН г. Астаны выше результатов учащихся Англии по трем группам навыков: количественные способности (умение оперировать цифрами); невербальные способности (классификация фигур, матрица фигур); пространственные способности (анализ фигур, распознавание фигур), что важно для изучения предметов естественно-математического цикла.
- ✓ Результаты учащихся ниже результатов учащихся Англии по вербальным способностям (чтение, словесные аналогии), возможно, по причине тестирования на английском языке, являющимся для учеников Интеллектуальных школ иностранным;
- ✓ Результаты учащихся 8 классов, отобранных для обучения с использованием теста способностей, сравнительно лучше результатов учащихся 10 классов.
- ✓ Данные результаты свидетельствуют об эффективности системы конкурсного отбора для приема учащихся, способных к изучению естественно-математических наук в соответствии с направлением Интеллектуальных школ;
- ✓ Способности к изучению естественно-математических наук позволят учащимся решать повседневные задачи широкого спектра во многих областях академического образования и в таких профессиональных областях, как математика, медицина, инженерия, архитектура, компьютерная графика и т.д.

Вопрос: как данные способности влияют на выбор будущей специальности ?

РАСПРЕДЕЛЕНИЕ ВЫПУСКНИКОВ ИНТЕЛЛЕКТУАЛЬНЫХ ШКОЛ ПО НАПРАВЛЕНИЯМ ОБУЧЕНИЯ, 2010-2016 ГОДЫ



СПАСИБО ЗА ВНИМАНИЕ