

Forecasting Students' Progress in University Education by Multiple Intelligences Using Vibraimage Technology and VibraMI Program

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Abstract: Considered a practically oriented model for solving the problem of student's abilities matching to the profile of an educational institution using vibraimage technology. The results of testing the profile of multiple intelligences for 128 first-year (2019) students of ETU LETI, St. Petersburg, Russia are given. The criteria for assessing the success of education in a technical university for students based on multiple intelligences profile are developed. Comparative analysis of multiple intelligences profiles of freshmen 2017, 2018 and 2019 was carried out.

Keywords: human resources (HR), abilities, vibraimage technology, multiple intelligences, rental behavior.

As in previous studies, in the 2019 study, the problem of matching abilities of the chosen specialty was studied. The first part of the study was conducted from 10/23/17 to 10/26/17, when 161 first-year students of the FKTI LETI were tested (Akimov et al., 2018). The second part was conducted from November 20, 18 to December 10, 18, when 84 freshmen of the same faculty were tested (Akimov et al., 2019). The 2019 study was conducted from 11/26/19 to 12/03/19 and included testing of 128 first-year students of the FKTI LETI. Due to administrative restrictions in 2019, testing of first-year students was carried out at only one department of Computer Engineering (CE) of the Faculty of Computer Technology and Informatics.

If we consider the logic of tested students selection, then the research of 2019 is more similar in logic of selection to the study of 2017 (testing was mandatory for each freshman of this faculty for each student) than to select students for testing in 2018, when each decision to pass testing student accepted voluntarily. As a result, in 2019, 128 of the 150 students of the department were tested.

In the forecast of academic performance of first-year students, the profile of multiple intelligences (MI) was analyzed using vibration imaging technology. The tests performed showed the prospect of assessing the success of students using VibraMI (VibraMI, 2020) program.

Materials and Methods

Testing was performed using the VibraMI program (VibraMI, 2016). This program of psychophysiological testing (PPT) of a person is based on the technology of vibraimage, the conversion in real time of a light video image of an object into an image formed by the accumulated interframe difference. Vibraimage technology (Minkin, 2007; 2020) and

the theory of multiple intelligences (Gardner, 1983) are united by a common dynamic approach to the study of human characteristics.

The profile of multiple intelligences (MI) is determined primarily by the worked out dynamic connections and the transmission of information signals between neurons of the human brain. The technology of vibramage, as applied to a person, analyzes the motor activity (microvibration) of a person's head and converts motion parameters into characteristics of a psychophysiological state (PPS). The line opposite questionnaire proposed by (Minkin&Nikolaenko, 2017) allows to convert conscious responses and recorded changes in PPS into a multiple intelligences profile. Thus, the practical task of detection students' abilities to MI profile of the chosen specialty is realized.

In 2017, all students of FKTI LETI were invited to undergo testing. Students were additionally informed about the day of the week, time and place of testing. In 2018, the conditions for testing organization underwent some changes. The standard briefing regarding the testing procedure itself was supplemented with information that "all interested students" can pass the test. Thus, the concept of "all students" has been replaced by the concept of "all comers".

In 2019, testing was again mandatory for all first-year students of FKTI LETI. During the testing in 2019, 128 of the 150 students enrolled in the department were tested.

The first feature of testing students in 2019 was that for the first time students represented the only one CE department. Historically, due to the relevance of the specialty, the passing exam score (262 points) for this department exceeds the university average passing score (252 points) and passing points for other departments of the faculty. The average score of: "state employees" students (86 people) admitted to budget places is from 262 to 270 (80% of the composition) and from 271 to 291 points (20% of the composition).

Another feature of testing is a significant number of "privileged" students (64 people) who are accepted under a contract or targeted recruitment and who have an average Unified State Exam (USE) score (from 155 to 260), which is significantly lower than the passing score required for admission to the department in 2019.

Comparative analysis of multiple intelligences profile for first-year students during three years

Let's consider how the averaged profile of multiple intelligences among first-year students of the FKTI LETI on 2017, 2018 and 2019 changed.

A comparison of the general MI profiles for 2017 and 2019 revealed differences in the ranking of the leading types of MI. In 2017, first-year students of the logical-mathematical (67%) MI ranked first in the hierarchy of MI in relation to naturalistic (65.8%) and ascetic (64.6%) types (fig. 1). While in 2019, the logical-mathematical (67.3%) MI was in third place, giving first place to the ascetic (68.8%) type of MI and interpersonal (66.4%) MI.

Interestingly, for three independent samples within three years, close values were obtained for the severity of the logical-mathematical MI (in 2018, this indicator was 66.9%), but there are differences in the overall structure of the MI profile. This fact once again confirms the previously put forward hypothesis that according to the severity of one of the types of MI it is impossible to draw a conclusion about the availability of abilities for technical or humanities.

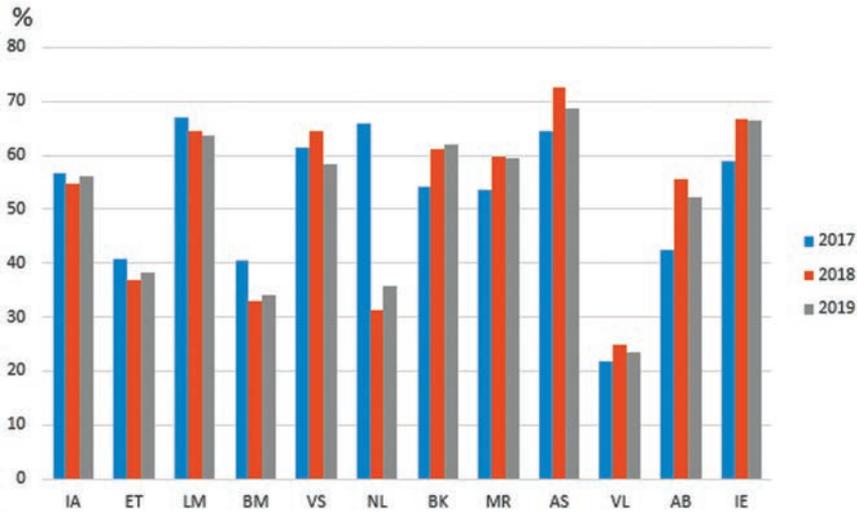
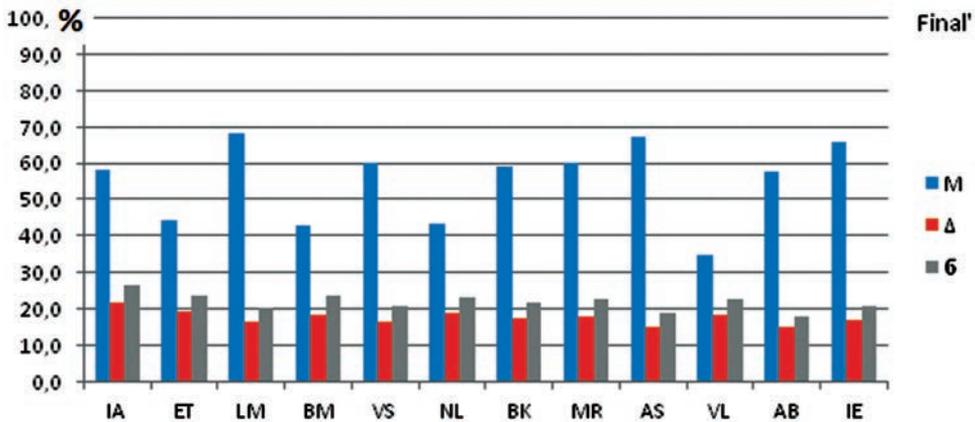


Fig. 1. The general profile of multiple intelligences in freshmen over 3 years.

Legend: IA – intrapersonal, ET – philosophical research, LM – logical-mathematical, BM – business-commercial, VS – visual-spatial, NL – naturalistic, BK – bodily-kinesthetic, MR – musical rhythmic, AS – ascetic, VL – verbal-linguistic, AB – creative, IE – interpersonal types of MI.

Comparison of MI profiles among students who passed through the competition and enrolled in budget places (fig. 2), and those enrolled on “privileged” grounds (fig. 3), obviously shows that among “benefit” humanitarian MI and logical mathematical MI takes only the fifth place, but among the “state employees” logical-mathematical MI is the leading one.



- 1. LM – logical-mathematical type of MI – 67,1%
- 2. AS – creative type of MI – 65,7%
- 3. IE – interpersonal type of MI – 65,2%
- 4. VS – visual-spatial type of MI – 59,3%

Fig. 2. Averaged profile of multiple intelligences in “state employees”

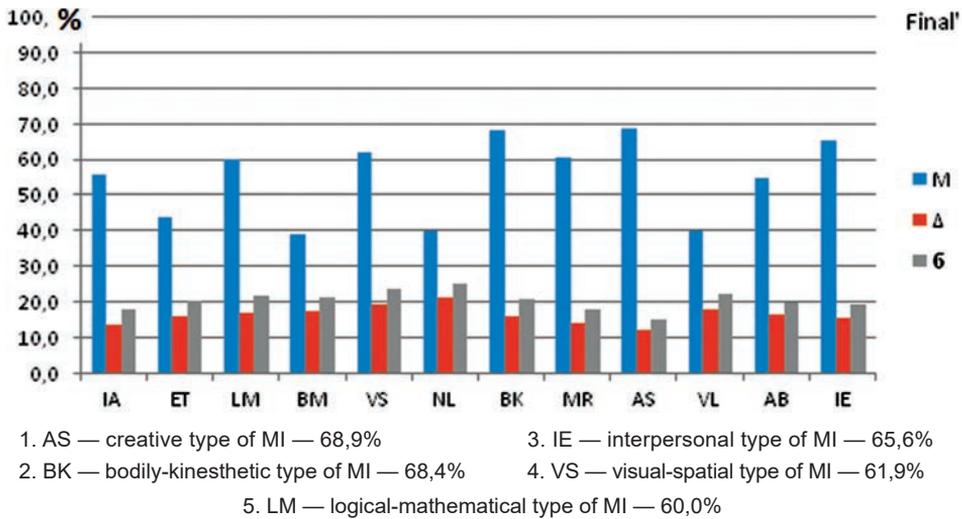


Fig. 3. Average profile of multiple intelligences of "privileged" students

The location of MI types on the histograms in the VibraMI program suggests that from 1 to 6, MI types correspond to the technical profile, and from 7 to 12 — to the humanitarian (Arts). A comparison of the test results for 2017, 2018 and 2019 revealed an increase in Arts profile relative to the technical one, from 48% to 54% (fig. 4). Interestingly, a similar trend was revealed when comparing the results of 2017 and 2018. But this indicator in 2018 and in 2019 completely coincides.

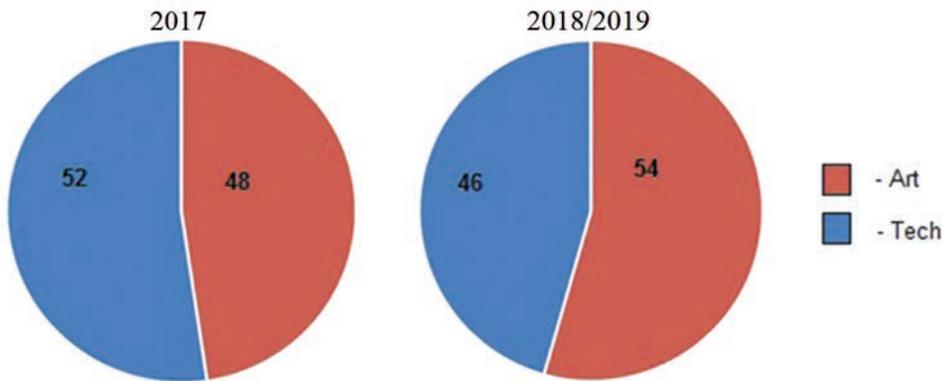


Fig. 4. Ratio of Arts and Tech profiles

The coincidence of this indicator in 2018 and 2019 is especially interesting, since in 2018 this trend was explained by the influence of rental behavior among tested students. It was believed that for the most part, students with weaker technical abilities arrived for testing, and mathematically gifted students with a well-developed logical and mathematical MI preferred testing to attend classes.

When comparing the distribution of MI profiles among “state employees” and “privileged” (fig. 5), we can clearly say that the first category has a larger technical profile (48%) than the second (44%). But at the same time, both categories still have a leading Arts profile.

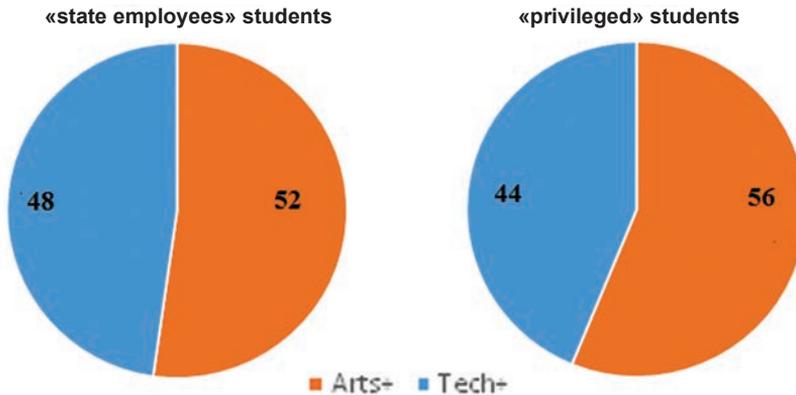


Fig. 5. The ratio of Arts and Tech profiles of “state employees” and “privileged” students in 2019

In 2019, students with Arts profile, for the most part, studied on a contract basis. And among the students who were tested and were expelled based on the results of the first session, 15 people had Arts profile priority and only 2 — technical.

Comparative analysis of multiple intelligences profile according to the results of the exam and the first session, in different groups

As in previous years, studies on the results of USE and the results of the first session of 128 students who passed MI testing were divided into 3 groups according to the degree of success of passing USE and the first session. As a criterion for assessing success, the total exam score was used. The first group included students whose total USE score was less than 239, the second group — from 240 to 261 (i.e., they did not reach the passing grade at the VT department), the third group — students with a total USE score of more than 262 (i.e., all received in budget places).

Based on the 1st session results, 3 groups of students were also formed, depending on the results of passing 6 disciplines. The first group No. 1 of the least successful students included students who received an average score of less than 3 based on the results of the first session. This group included expelled students and students who closed the session with big problems and already after the deadlines for the additional session. The second group No. 2 included students who received an average score from 3.01 to 3.99 and closed in an additional session. The third group No. 3 included students with an average score of 4 or more and who closed in the main session.

Compare the results (fig. 6) according to the exam with the results of the 1st session in group No. 1 (the least successful students). Analysis of the exam results in group No. 1 revealed the predominance of the ascetic type of MI (72.3%). Second and third places (in descending order): bodily-kinesthetic (67.4%) and interpersonal (66.1%) (fig. 6a). The logical-mathematical type of intelligence, in the group with the lowest exam score, was in seventh place (57.6%). When comparing the results of USE with the data of the first session, it turned out that the order of arrangement of MI types slightly changed: ascetic (73.9%), interpersonal (67.4%) and bodily-kinesthetic (62.9%), logical and mathematical intelligence took sixth place (56.5%) (fig. 6b).

Thus, with a slight change in the numbers of MI, the overall profile in this group remains almost unchanged. The most likely reason for the generality of the data obtained is the motivational aspect of attitudes toward learning: unsuccessful students do not seek to move into the category of successful ones (they do not make enough effort to develop a logical-mathematical MI). This conclusion was clearly traced in previous years of testing.

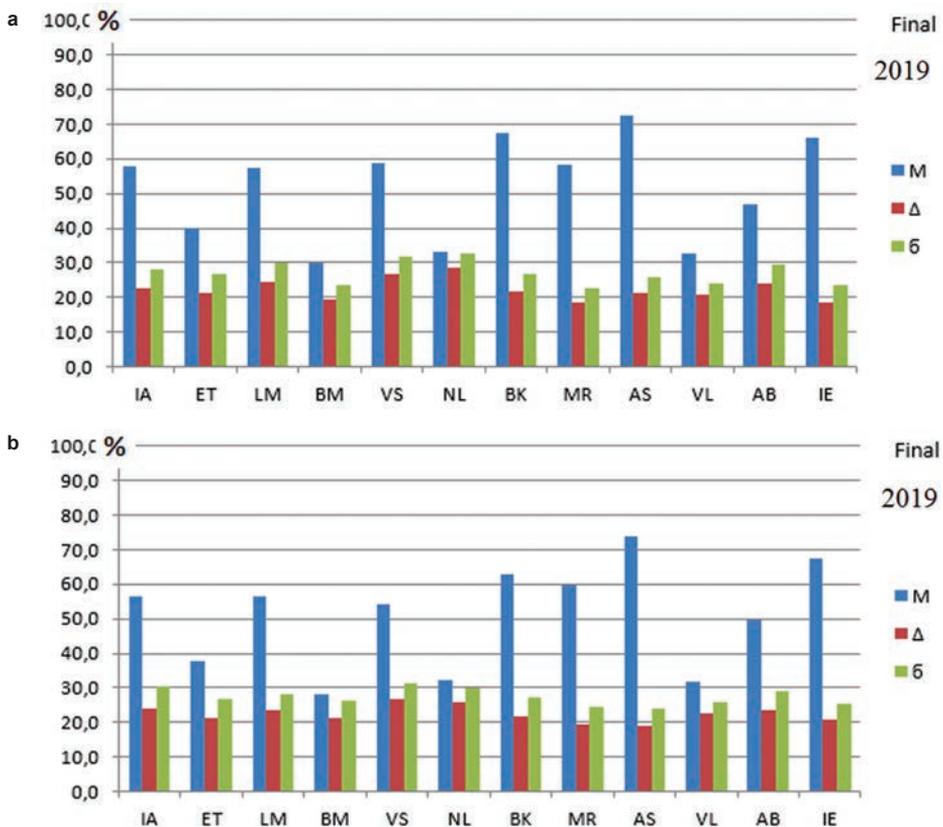


Fig. 6. Averaged profile of MI in group No. 1, formed on the basis of USE (a) and the 1st session (b)

Consider the data obtained in group No. 2 (students with average performance). According to the results of USE in group No. 2, the logical-mathematical MI (51.7%) occupied the fifth place in the hierarchy of MI in relation to interpersonal (80.3%), ascetic (71.4%), bodily-kinesthetic (66.5%) and musical rhythmic (54.2%) (fig. 7a). But according to the results of the first session, for students with average academic performance, the logical-mathematical MI (66.2%) sharply shifted to 2nd place in relation to all other types of MI (fig. 7b).

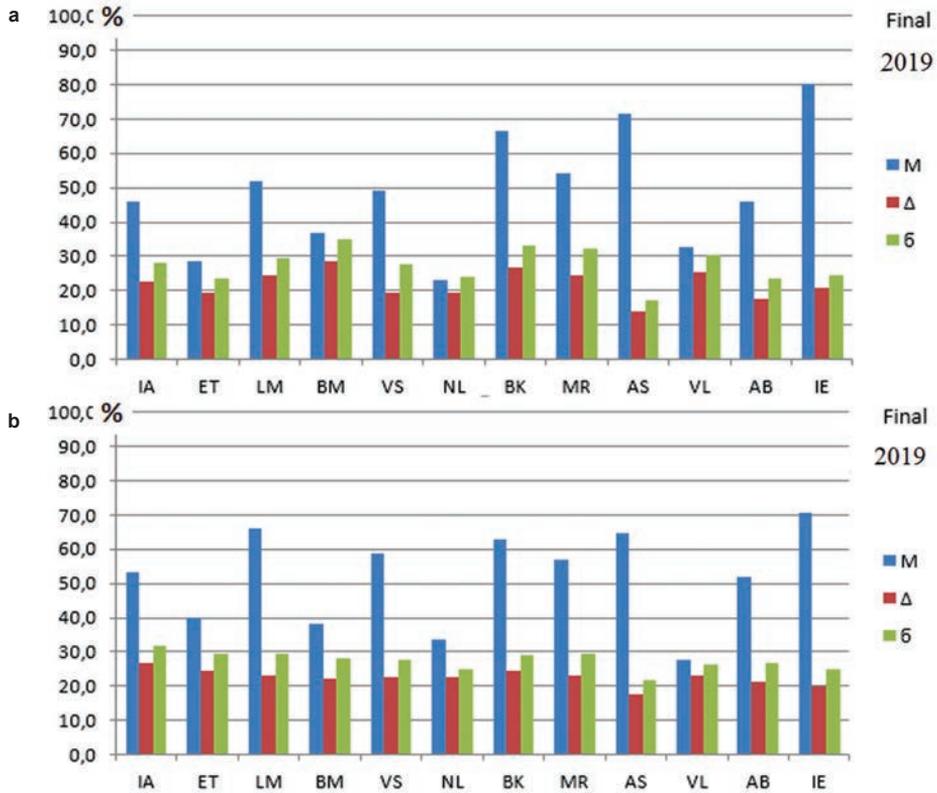


Fig. 7. AveragedMI profile in group No. 2, formed on the basis of USE (a) and the 1st session (b)

Traditionally, the first place was left to interpersonal MI (70.7%), the third — to ascetic MI (64.9%). A similar trend was obtained in the 2017 sample: according to the results of USE, the logical-mathematical (66.1%) in second place; following the session — in the first place. Thus, students with average academic performance are quite similar in their potential.

Analyzing the results of the study of this group of students over three years, we can confidently say that the most likely reason for the change in the hierarchy in the MI profile is the motivational aspect of the attitude to the development of abilities.

Probably students with average academic performance are those who, due to different life circumstances, did not fall into the category of the most successful students (could not score enough USE points to overcome the passing score for the department), despite the good potential. But these students are making enough efforts to develop their abilities.

Consider the results of group number 3 (the most successful students). According to USE results, the logical-mathematical (67.7%), followed by the ascetic (66.1%) and interpersonal (64.2%) types of MI in the first place in USE results (fig. 8a). After the session, the location of MI in the profile changed: the ascetic (67.1%) came first, followed by the logical-mathematical (66.2%) and bodily-kinesthetic MI (62.2%) (fig. 8b).

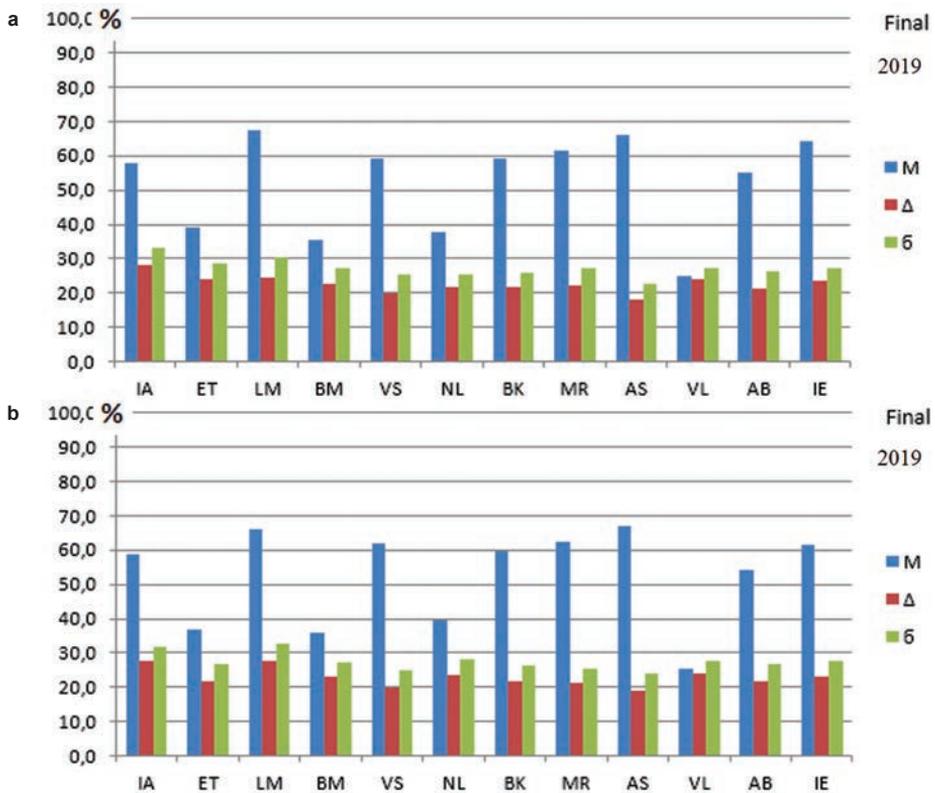


Fig. 8. Averaged MI profile in group No. 3, formed on the basis of USE (a) and the 1st session (b)

While students of this group, while maintaining the general profile of multiple intelligences, there are insignificant fluctuations in MI values and it can be concluded that students from this group (and all those who came to budget places) confirmed their level in USE (out of 77 tested students in this group in only 1 person was expelled from the session). They are making enough efforts to further develop their

abilities. Moreover, it is not the presence of one pronounced type of MI that matters, but its location in the MI profile.

Prediction of student performance based on the study of MI profiles of successful students

As the studies of students in 2017–2019 showed, the methodology of career guidance is quite realistic when, when choosing a university, the profiles of MI applicants are compared with the profiles of MI of successful students of one or another specialty of the chosen university.

Consider the MI profiles of students, dividing their groups by the degree of success of the first session and by the criterion of a Tech or Arts MI. According to the degree of success of passing the session, we distinguish three levels: those who passed the session by 5 and 4 (fig. 9), who passed the session with an average score slightly higher than 4.0 (fig. 10) and who did not pass the session or passed it after an additional session (fig. 11).

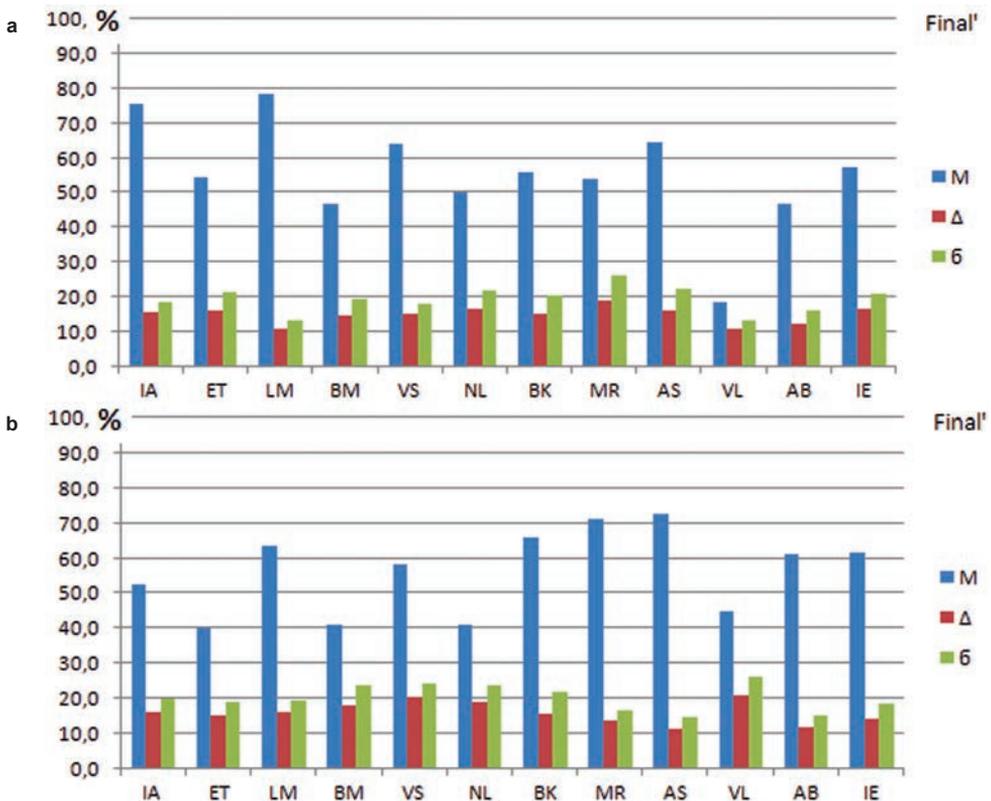


Fig. 9. MI profiles of students who passed the session on 5 and 4:
a) MI Tech; b) MI Arts

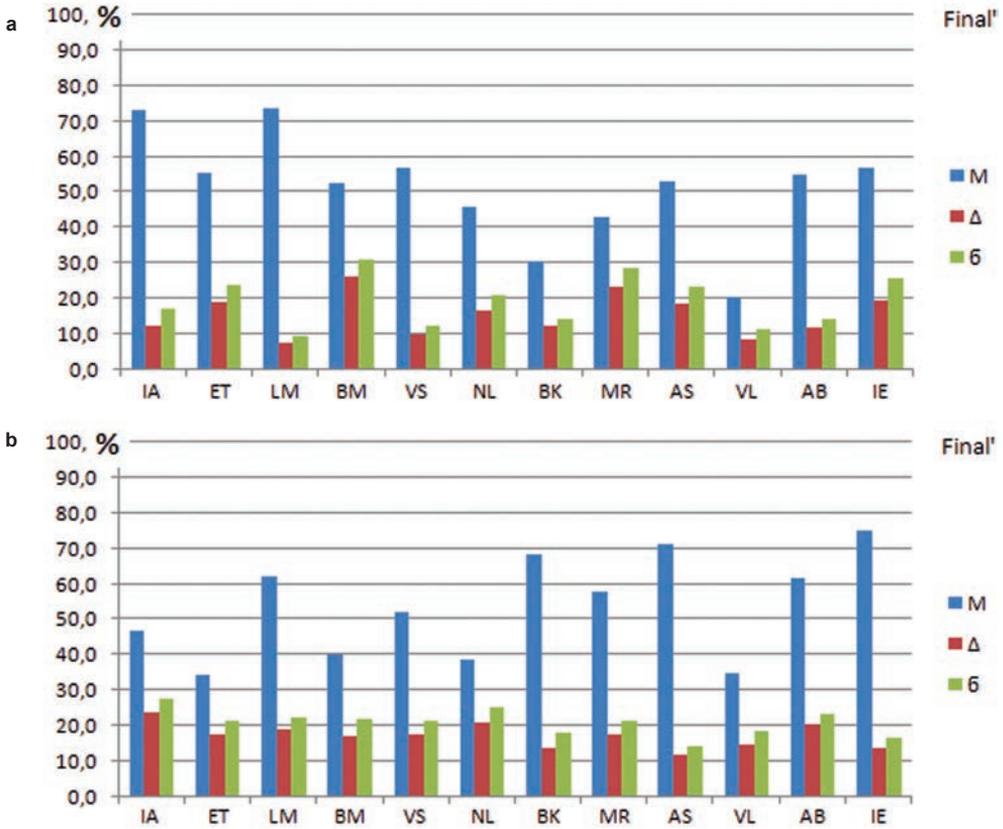


Fig. 10. MI profiles of students who passed a session with an average score higher than 4.0: a) MI Tech; b) MI Arts

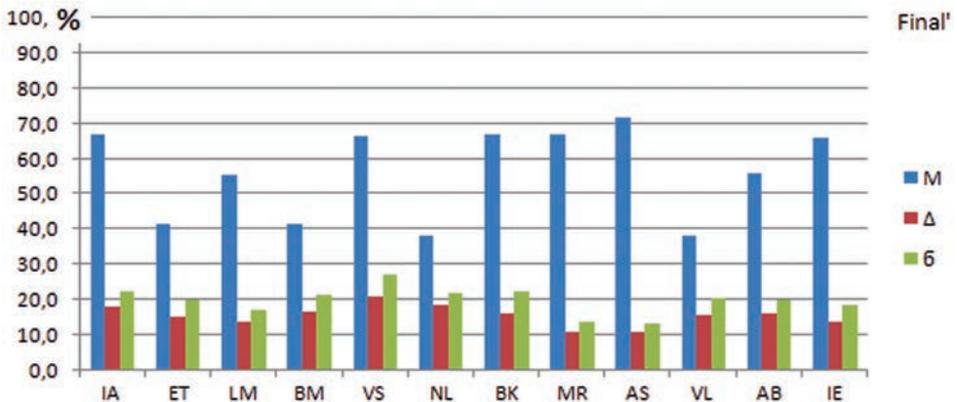


Fig. 11. MI profiles of students who did not pass the session passed at the last moment.

So, what conclusions can be drawn by analyzing the data obtained from the table:

1. For successful students, the logical-mathematical MI type has high value, more than 60%. For students with leading Tech profile, it is noticeably higher than for Arts.
2. For successful students with a technical profile, intrapersonal MI is predominant, i.e. they are able at the right time to “force themselves” to do what is required of them and better do independent work. Arts, on the contrary, feel better in a team where they achieve their tasks in the course of communication and collective decision of tasks.
3. Students with leading Tech profile have bodily-kinesthetic MI type less noticeable than Arts. This is probably due to the fact that students with Arts bias, having fallen into the environment of a technical university, are more interested in new “subjects” in their surroundings, but for students with a technical bias, most of these subjects have long been known since school.
4. The ascetic MI type is always high among all groups of students, but prevails among Arts. This is due to the motivational component in freshmen. Having begun a new stage in their life and learning, they are “burning” with the desire to achieve something in it.
5. Visual-spatial MI is more than 50% for all groups of students and is noticeably higher only for excellent students with a technical profile and bad students.

Table summarizes the data on the predominant MI of all considered groups of students.

Table

Predominant MI for the student groups

	Logical-mathematical (LM)	Visual-spatial (VS)	Intrapersonal (IA)/Interpersonal (IE)	Bodily-kinesthetic (BK)	Ascetic-Sacrificial (AS)
4 and 5 scores MI Tech	78,4	64,2	75,3 / 57,4	56,1	64,3
4,0 scores MI Tech	73,7	56,7	73,0 / 57,0	30,7	53,1
4 and 5 scores MI Arts	63,3	58,4	52,6 / 64,5	66,2	72,4
4,0 scores MI arts	62,2	51,9	46,7 / 75,2	68,4	71,2
Failed exams	55,3	66,5	67,1 / 66,1	66,9	71,5

Conclusion

The testing, once again showed the prospect of assessing the success of students using the VibraMI program. The test results of 2017 and 2019 are generally similar, which may mean the legitimacy of the data obtained, but at the same time, there is some difference, allows to track the tendency of applicants to enter universities.

Analysis of MI profiles among successful students and students who failed the session showed differences in abilities. The success of training at the Department of CE is determined by the high values of the logical-mathematical type of MI, the intrapersonal and/or interpersonal type of MI (depending on the profile: Tech or Arts) and the high values of the ascetic and bodily-kinesthetic types of MI.

In general, applicants and institutions, corresponding to the abilities and multiple intelligences profile, can successfully use the developed methods to select the optimal university and department.

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