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Microlearning as a new method of teaching soft skills to university students

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Soft skills are very important in the modern world, both for communications and planning daily life and, as both employers and students claim, for career and professional activities. The development of soft skills can occur independently, but there are opportunities to teach them, including at university. Different formats can be used for this, and one of them is microlearning, using a cell phone and the student's interaction with the teacher and the group on social networks and educational platforms. This format has been applied to two courses at ITMO University: study skills and emotional intelligence. An experiment was conducted, which showed that students who took the course in the microlearning format received the same amount of information and were able to apply it just as well as students who took the course in the classical learning format. Based on the successful use of such a format as microlearning and all its advantages described in the article, in the future it is proposed to form other courses using this learning format.

KEYWORDS

microlearning, mobile technologies in education, higher education, soft skills, evaluation of the education effectiveness

1. Introduction

In the simple model of professional competencies (Riyanti et al., 2017) there is a separation into two types: hard and soft skills. Hard skills stand for narrow professional abilities that are required to work on daily issues. They are necessary for specific tasks, are formed in the process of training and are based on technical knowledge (Hendarman and Cantner, 2018; Sopa et al., 2020). Soft skills are a large set of over-professional competencies that are not related to a specific specialty, while contributing to the effective performance of professional functions and career advancement. They are mostly related to communication, workflow alignment, and personal productivity (Claxton et al., 2016; Matteson et al., 2016).

The opinion on the importance of acquiring flexible skills is often the same for different groups of people studying this issue: they should be developed on equal terms with professional competencies, since they are equivalent to them in importance for the job (Balcar, 2016; Duhigg, 2016; Davidson et al., 2017; Zuo et al., 2018). Many employers already pay significant attention to the possession of soft skills, highlighting critical thinking, problem solving, self-management, stress tolerance, and emotional intelligence as the most important ones (World Economic Forum [WEF], 2020; Diokno and Peprah, 2021). In addition to looking for these qualities on resumes (Stewart et al., 2016), employers are also looking for

the ability to apply these skills in the workplace and when running errands, as it is soft skills that help with team coordination and maintain a productive atmosphere (Fernandez and Liu, 2019). Thus, nowadays, knowledge and practice of soft skills are vital for successful employment and subsequent quality work in a company (Davidson et al., 2017; Szilárd et al., 2018), and therefore there is a question of acquiring and practicing them.

The current interest of companies in the soft skills of employees has made it profitable and important to teach such subjects directly in the educational process while obtaining a degree in higher education (Hirsch, 2017). Many universities have already begun this practice by hiring experts in the fields of psychology, self-management, personal effectiveness, and teamwork coaches (Caeiro-Rodríguez et al., 2021). A "Consortium of Universities for the Development of Universal Competences" has been created in Russia. HSE University, ITMO University, Ural Federal University, Tomsk State University, and Tyumen State University joined the ach of these universities has the most advanced programs to develop soft skills in students, as well as research in this area (Ponomaryova et al., 2019; Arlashkina and Romanenko, 2021; Gerasimova and Orel, 2022). The importance of soft skills for professional training in higher education has also been noted in various works (Stewart et al., 2016; Hirsch, 2017), including those that seek alternative approaches to education (Hendriana et al., 2022), such as games (Dell'Aquila et al., 2016; Viviers et al., 2016). Moreover, in the case of researchers from China and Australia, experiences of international collaboration and learned success have been studied and described for application to soft skills training in higher education (Yan et al., 2019), which further demonstrates the interest of universities in teaching students such needed competencies nowadays.

Training in over-professional competencies can be organized in a variety of formats. In addition to independent study of scientific and popular science literature on various soft skills and their development, there is an opportunity to take various courses and trainings, which can be offered in face-to-face (Gibert et al., 2017; Jones et al., 2017) and online (asynchronous or massive open online courses, as well as group webinars) formats (Charoensap-Kelly et al., 2016; Dell'Aquila et al., 2016; Naamati Schneider et al., 2020; Puah et al., 2021; Volkov et al., 2022). The difference between online and offline training is presented only in the form of their passing, according to the results in both cases soft skills are acquired and actively used by participants. At ITMO University soft skills training was held in the format of classical university classes, where lectures are combined with practical exercises, in which students can practice the theoretical material obtained in lectures. However, the idea of creating a new course in a format called "microlearning" arose in view of the benefits of online learning, such as:

- Rapid transfer of soft skills into students' hands-on experience;
- Convenience for busy students due to less time required to master the subject;
- And increasing the personalization of universal skills instruction through the introduction of new learning formats.

In addition, a number of problems in teaching soft skills led to the creation of the course in this training format. First of them was the lack of students' interaction with the content in the same proportion in the classroom. Mobile microlearning lets each student give more equal access to learning. The second challenge was the rise of engagement in the classroom–microlearning format drives engagement, as students regularly interact with the course and their personal contribution is assessed. It is also worth saying here that microlearning is more inclusive, it targets learners who do not respond well to traditional classroom formats. One more problem was an unequal amount of time spent on the task: some students finish tasks earlier, while others need more time to complete the activity. Microlearning promotes a self-paced mode where every student can take more time to complete the activity if needed. And last but not the least–the problem of transferring soft skills into the real life of students. Those skills develop better when educators introduce them into students' lives little by little, but on a regular basis. That the once-a-week class format does not provide the same engagement and does not help turn a new skill into a habitual pattern of behavior. That is why the idea of a mobile learning format seems successful due to the frequent contact with practice, transferring the skill to real life, while not spending a lot of the student's time.

Microlearning is a new evolving format (Leong et al., 2021) that incorporates advantages such as convenience, less time, and new opportunities for learning (Gabrielli et al., 2017; De Gagne et al., 2019). Integrating this format into the educational process is in an area of interest for higher education, including soft skills training.

2. Materials and methods

2.1. Creation of the microlearning format

Micro-training was defined as a format representing an online course that students participated in via their mobile phones and where interaction took place through communication in groupchat on the Telegram social network (n.d.) and Learning Management System platform Moodle (Moodle online platform, n.d.). At the first stage of implementation of this format to the educational process, the course organizer (the tutor) should conduct an analysis to make sure that the discipline will not lose its advantages due to the transition to the new format. Some criteria to follow:

- Participants have the ability to learn using mobile devices as well as they are able to use software or any social network with group chat functionality;
- Program time is not designed for full school/work days;
- The skill does not involve constant synchronous communication and does not involve long synchronous sessions, e.g., negotiations or strategy meetings.

If after analysis it is decided that the skill can be taught in a micro-format, the teacher then needs to:

- Conduct methodological work to develop objectives;
- Develop a system for evaluating student results;
- Develop a content plan and timetable, dividing the material into bite-sized learning assets;

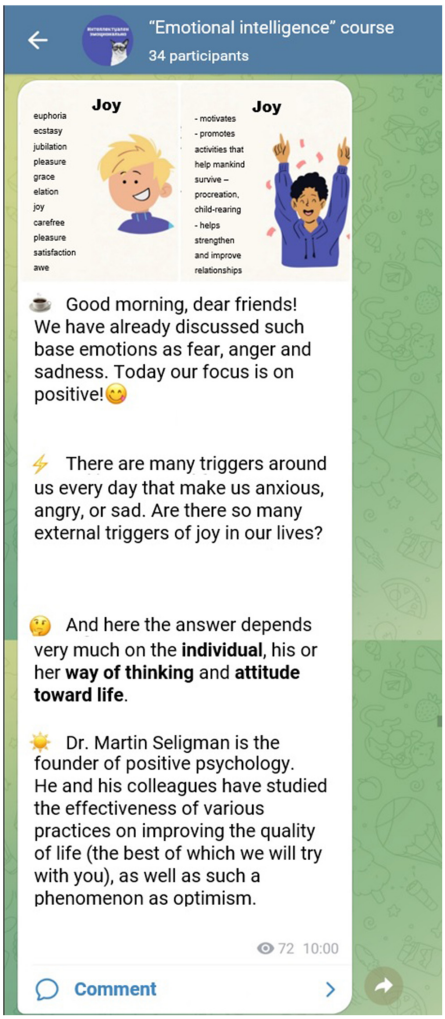


FIGURE 1
Screenshot of Telegram chat message with digital cards.

- Choose appropriate formats of assignments for students of different levels to study theory and practice, as well as formats for grading assignments;
- Identify channels and formats for group and individual interaction with students, messengers, and tools for collaborative content creation;
- Plan in detail and develop each instruction, assignment, and type of interaction;
- Design the system of engagement students into the learning process to maintain the high group dynamics in the group chat at Telegram;
- Create the content and materials for the microlearning (pdf-cards with the key tips, longreads, short video lectures, animated texts for the posts in Telegram).

After the detailed design of the microlearning program is followed by its test implementation phase. A small portion of the program is tested on all platforms and interaction channels used. The teacher must take part in the testing, which can also be conducted with the participation of a focus group. At this stage, participants fix problems and errors, which are eliminated before the real educational group starts training.

The next stage is to conduct microlearning. Here the main role of the teacher and the administrator is to work with the motivation and involvement of students, stimulate active interaction with the learning materials, and provide timely constructive individual and group feedback. Some examples of working with motivation can be: quick reactions to comments and questions, analysis of collective assignments, awarding nominations for the best answers, polls and voting, showing the results of creative assignments. And the last stage is the evaluation of the results, the analysis of opportunities for improvement of the process.

The following criteria were evaluated when selecting microlearning as a method of teaching soft skills to university students:

1. The learning objectives could be achieved with this method.
2. The method achieved a higher level of individualization and personalization.
3. The learning process was engaging, active, flexible, and learner-centered.
4. The method matched the learners' personalities.
5. The method can be used with available technology and resources.

Microlearning as a learning method satisfies all criteria. This choice is also supported by the fact that many universities use faculty-initiated microlearning in the classroom because it engages students in the subject and leads to deeper learning, encouraging them to connect the subject to their daily lives and the world around them (Skalka and Drlík, 2018).

The ITMO University internalization management team teachers developed and piloted two courses in microlearning format for three groups of 3rd year undergraduate students (74 students) in autumn 2022: "Learning and Working with Information Skills" (1 group) and "Emotional Intelligence" (2 groups).

2.2. Implementation of microlearning format

To achieve the goals of mobile microlearning, the courses used small assignments in a variety of formats that students received on their mobile devices twice a day during the course: the theoretical material was presented with digital cards (which are a format of content used for microlearning, usually presented as a set of pictures with some text or infographics on a particular topic; digital cards are used to simplify and visualize course information and help break down blocks of texts into a series of images), longreads, infographics, and short videos. Figure 1 presents an example of a message containing text for reflection and interaction, as well as cards with information on the topic. Figure 2 shows a message with one of the videos offered for viewing as part of the course. Figures 3, 4 show the assignments offered to students in the Emotional Intelligence and Learning and Information Skills courses, respectively.

As practical assignments, students were offered cases, creative assignments, different types of tests, group work on Miro and Jam Board, essay writing, and reflection assignments. Microlearning took place using two main channels of interaction with students:

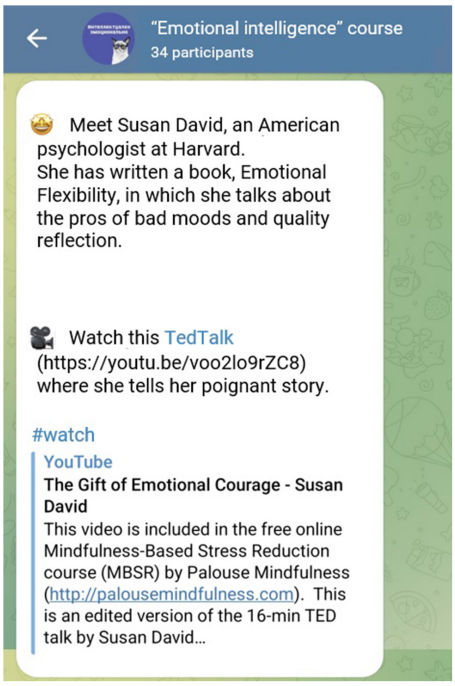


FIGURE 2
Screenshot of Telegram chat message with video.

Moodle platform for individual assignments and tests, for which students received personalized feedback, and in Telegram messenger channels, where the bulk of the microlearning took place (assignments were announced, surveys were offered, students communicated, completed assignments and received group and personal feedback from the teacher and nominations for best work, administrators provided technical support to participants).

The effectiveness of learning in the courses "Learning and Information Skills" and "Emotional Intelligence" was assessed in order to analyze the knowledge acquired by students, as well as to identify the ratio of information learned by both students taking courses in the classical format and those taking them in the new micro-format. This is how it was planned to get confirmation of the thesis that these formats are similar in effectiveness and can be chosen by students depending on their format preferences.

2.3. Experimental design

The first microlearning course "Learning and Information Skills" was conducted without taking part of the present study, but when students completed a final test (in a form of questionnaire with theoretical tasks, see the **Supplementary Material** to download the PDF version of the test), the results became an indicator of effectiveness. The results of the final test in this course became the basis for a more extensive study of learning effectiveness, since the result after taking the course cannot be indicative if there is no way to compare it with the level of knowledge before taking the course. In this regard, entrance and exit testing with three parts of assignments were prepared for the "Emotional Intelligence" course:

- Part 1 with theoretical questions (students were asked to test their knowledge at the beginning of the course and at the end to evaluate the effectiveness of teaching theoretical material);
- Part 2 with situational tasks (students were offered tasks on how to use the theory about emotional intelligence in practice, which served to assess the understanding of the applied part of the subject and the ability of those taking the course to apply their knowledge);
- Part 3 with subjective evaluation of emotional intelligence skills personally [students were asked to evaluate their emotional intelligence skills independently on a scale from confidence in possessing this skill to no skill, so that everyone could track their individual progress in this way (see the **Supplementary Material** to download the PDF version of the test)].

Also, after completing the course, students were offered a form to fill out feedback on the classes they had taken. The form contained both specific questions about the quality of the classes, the completeness of the information, and the organization, as well as an opportunity to freely describe their impressions of the course–to describe the advantages, disadvantages, and desires.

Thus, the following groups were formed in both courses: experimental (students took the course in the microlearning format) and control (students took the course in the classical format). A detailed description of the groups is presented in **Table 1**.

It was decided to take only one group of students to present courses in a microlearning format, since this was an experimental format and had not been done before. So for the first time we decided to have a limited number of participants. And, thus, there was a distribution of students into groups with microlearning and with the classical format in the ratio of approximately 1:3.

3. Results

3.1. Tests results

The results of the training effectiveness study were assessments of the data obtained after testing the students. From the course "Learning and Information Processing Skills" 20 students were tested in microformat and 59 students in classical training format. The number of correct answers to each test question was assessed for the groups that were taught in the different formats. The results of the final testing, which consisted of 15 questions, are shown in **Graph 1**.

For each question, the number of correct answers was estimated, and this data was converted into percentages. Thus, on average, there were 81 (±13) percent correct answers from students who took the course in the microlearning format, while for students who took the course in the classical format, the figure was 84 (±9) percent. A two-sample Student's *t*-test for unrelated samples was applied to perform a statistical evaluation of the differences between the samples: its result shows a qualitative difference between the samples. It was shown that there were no qualitative differences between the groups' results ($t_{Emp} = 0.6$, which is less than the critical

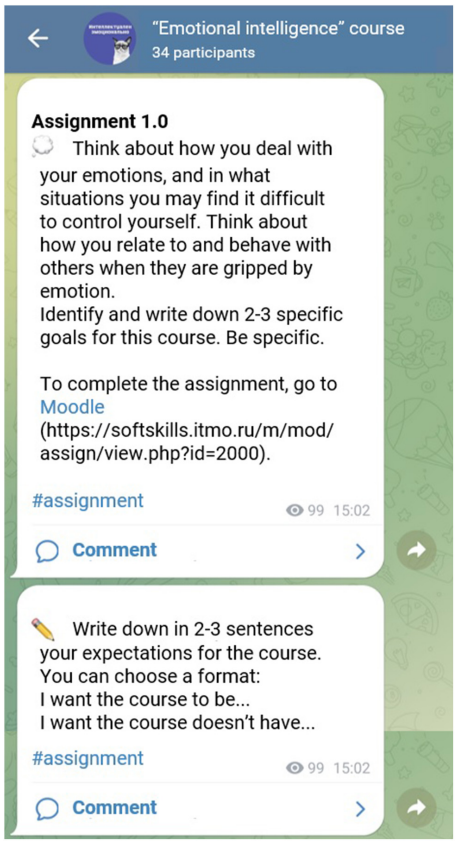


FIGURE 3
Screenshot of Telegram chat message with assignment in "Emotional Intelligence" course.

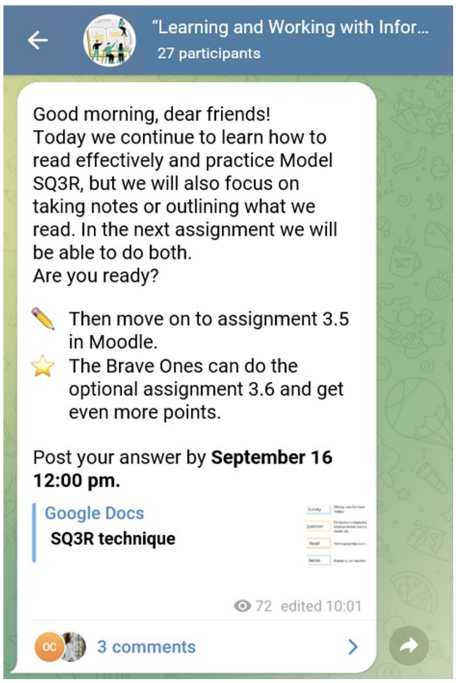


FIGURE 4
Screenshot of Telegram chat message with assignment in "Learning and Working with Information Skills" course.

value of 2.05 at $p \leq 0.05$). Thus, the similarity of the final results of the groups trained in two different formats was proved.

The evaluation of the effectiveness of students taking the "Emotional Intelligence" course consisted in comparing the results of entrance and exit tests. The evaluation system was as follows: for the theoretical part and for solving situational tasks it was possible to get 10 points each–the theoretical part assessed the number of correct answers to the test questions; the practical part assessed the completeness of the answer to the question and the ability to back up your point of view with evidence. The evaluation of eleven personal skills of emotional intelligence (the third block of questions of testing) was carried out by students themselves on a four-point scale, so that each participant could evaluate himself or herself with a maximum of 44 points.

The number of points received for each block of questions of the input and output tests was converted into a percentage. The results are summarized in Graph 2.

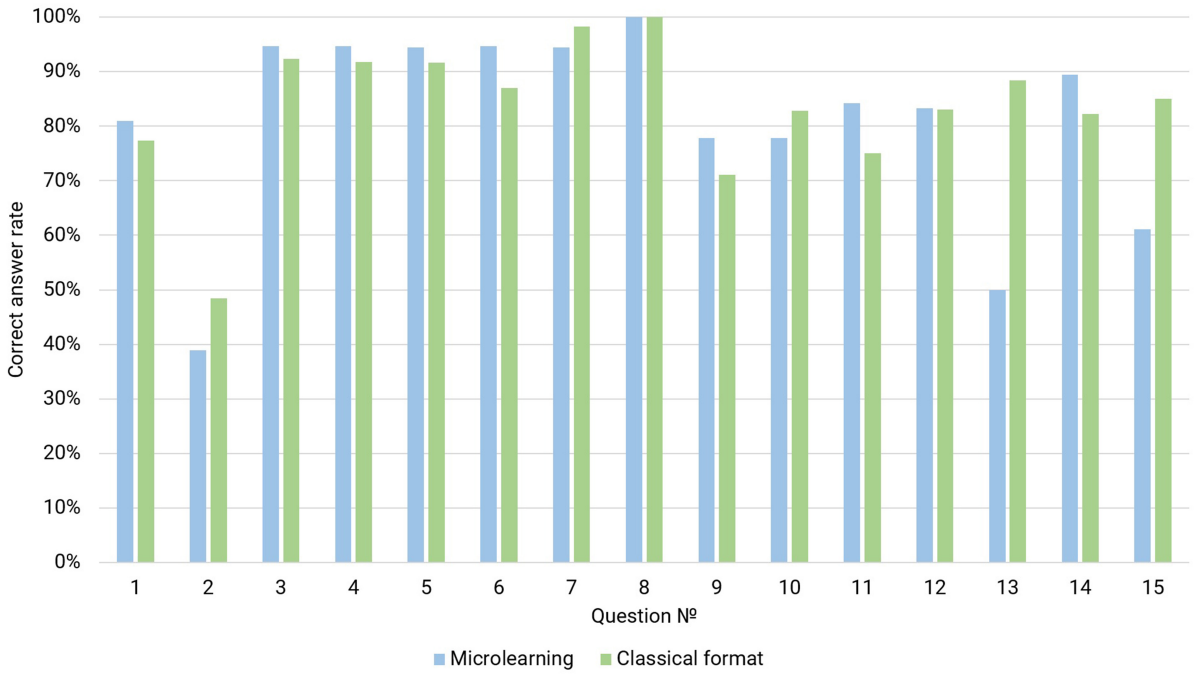
The percentage of input testing in the group of students who took the subsequent course in the microformat was higher in all three blocks of questions than in the groups of students in the classical format, which may be due to the different number of students in the samples (19 students in the microlearning and 60 in the classical). This may also partially explain the higher value of exit tests for the microlearning format.

TABLE 1 The description of the groups of students who participated in the educational experiment.

Course	Number of students in microlearning group	Number of students in classical format group	Description
Learning and Information Processing Skills	20	59	3rd year students, 33% female, 67% male
Emotional Intelligence	19	60	3rd year students, 46% female, 54% male

The individual success of the students was also assessed—for each student the difference between the input and output test blocks was evaluated to track his or her personal progress. The result of this evaluation was the conclusion that the greatest number of students received for the final test more points than for the entrance test: in the theoretical block—13 of 19 students of microlearning and 37 of 60 students of classic format; in the block of situational tasks solution–all 19 students of microlearning and 58 students of classic format; in the block of personal evaluation of emotional intelligence–17 students of microlearning and 51 students of classic format. The result indicates progress for the majority of students who took the course in both formats.

For both formats, the difference between tests and the average percentage of success in the group were calculated, which shows how much higher the students scored on the exit test. These results are presented in Graph 3.



GRAPH 1
Results of the final testing on the "Learning and Information Skills" course.

On average, the results of the final test increased compared to the entrance test for students in all three blocks of questions, which shows the effectiveness of the Emotional Intelligence course as a whole.

Progress on answers to theoretical questions in the course was, on average, 3% higher for microlearning students than for students who took the course in the classical format. This may be related to the higher score on the entry test (**Graph 2**), as well as to the number of students in the groups assessed, and partially confirms the thesis that when students take the Emotional Intelligence course in the microlearning format, the level of knowledge acquired will be equivalent to that of students in the classical training format. Individual assessments of personal intelligence skills also increased after taking the course, which demonstrates not only the progress in learning assessed by the researchers, but also the students' self-determined progress.

The greatest progress was made on the second set of questions, problem solving, which shows the effectiveness of learning not only the theory but also the application of emotional intelligence skills. This result is important for the study because the microlearning format does not involve a lot of personal interaction between students with each other and with the teacher face-to-face, which is part of the formation of emotional intelligence skills. However, even with this condition, students in both formats improved their results in solving situational tasks by 38%, which shows an improvement in their ability to apply emotional intelligence.

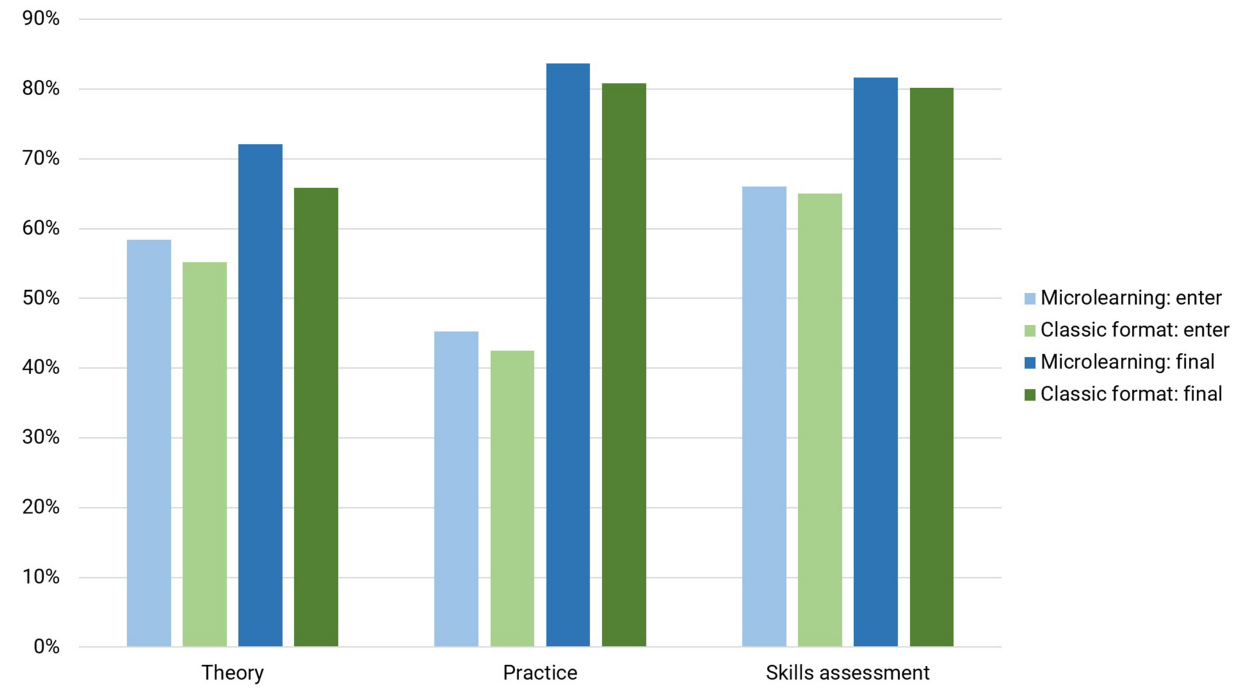
In the statistical evaluation of the comparison of the results of microlearning students and students who took the course in the classical format, a two-sample Student's *t*-test for unrelated samples was also applied, whose value demonstrates the presence of qualitative differences between the samples. When comparing with the help of this tool the progress in the results of the theoretical part of the test of both groups of students ($t_{Emp} = 0.7$), in the results of solving situational tasks ($t_{Emp} = 0.0$) and in the results of individual evaluation of emotional intelligence skills ($t_{Emp} = 0.2$) all empirical values of the criterion were below the critical ($t_{cr} = 1.99$) at $p \leq 0.05$. This shows the absence of qualitative differences between the groups' results, thus confirming the thesis that microlearning is equivalent to the classical training format in terms of material content and teaching effectiveness in the "Emotional Intelligence" course.

3.2. Feedback results

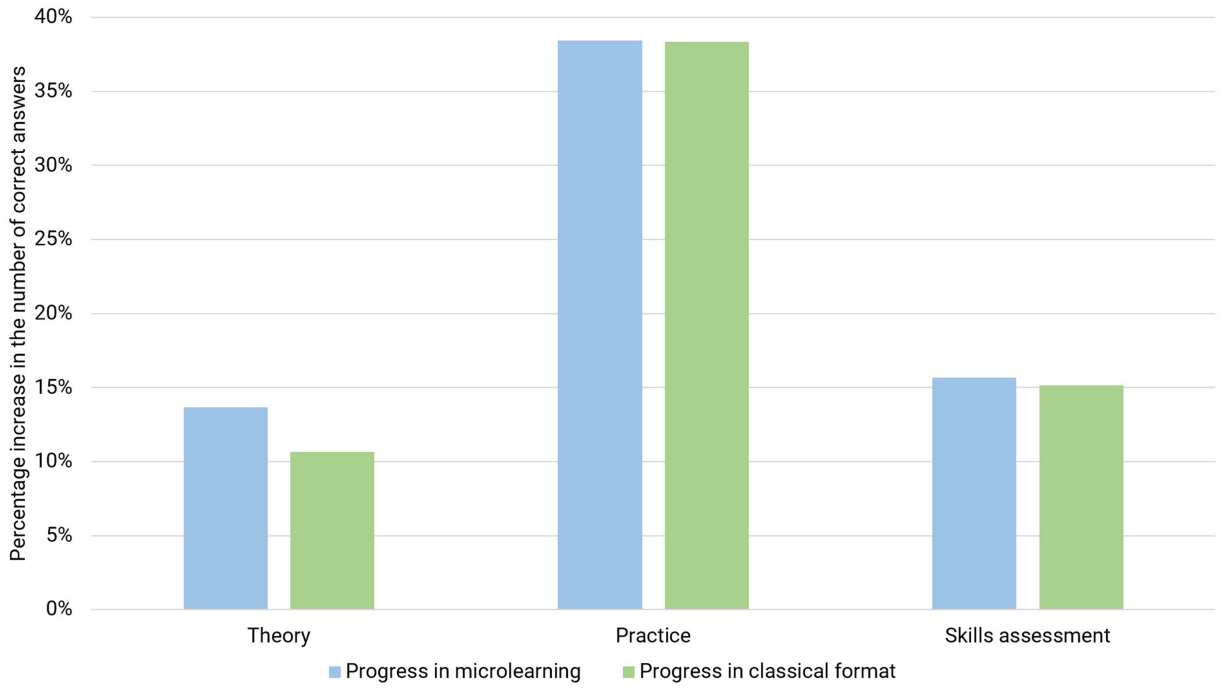
After analyzing and processing the data from the feedback questionnaires, the team identified the main metrics reflecting the effectiveness of microlearning in the two courses conducted.

100% of students in the "Learning and Information Skills" microcourse provided feedback. In the traditional format groups, this figure was 60%. Overall satisfaction with the discipline in the microformat was 82%. All students in the group rated their satisfaction with the instruction as high as possible. Students were asked the question, "How willing would you be to recommend the course format to a prospective student if they had a choice between a traditional course and microlearning?" 87.5% of students responded that they would recommend or rather recommend this format to prospective students. 83% of students said they would be willing to take a course in another subject in a mobile microformat.

Feedback on the Emotional Intelligence mobile course was received from 86% of students, while only 64% of students said they would be willing to take the course in the traditional format. Overall satisfaction with the discipline in the microformat was 93%. In this course as well, all students rated satisfaction



GRAPH 2
Input and output test results for groups of students of two different learning formats.



GRAPH 3
Percentage of student group progress on the Emotional Intelligence course.

with the teaching as high as possible. When asked about their willingness to recommend the format to prospective students, 90% responded that they were willing and more likely to recommend microlearning, and 86% were willing to take another course in the new format themselves.

Course teachers and students noted that the format allowed them to work through the material more thoroughly and to start applying it in real situations and on learning tasks already during the course. Many students appreciated the convenience and mobility of the format when it is necessary to combine

study and other activities, and also highlighted the fact that the division of the course into micro parts increases the level of organization and discipline.

4. Discussion and conclusion

The purpose of this paper is to evaluate the effectiveness of using a new format of soft skills training for universities–microlearning. The results clearly show that the soft skills courses presented in this paper could well be converted to this format or take place in a mixed format for several groups of students with a choice.

The thesis that online education is often no less effective than the face-to-face method is supported by many works. However, there are only a few such comparative works in the field of soft skills education, due to the complexity of choosing evaluation criteria as well as the possible subjectivity of the results (Charoensap-Kelly et al., 2016; Devedzic et al., 2018; Baviera et al., 2022). The results of the present study support our assumption that the microlearning format can be used in training on par with and in conjunction with the classical format.

The qualitative conclusions in this experiment on the implementation of microlearning are confirmed by statistical processing of the results. All three aspects of soft skills training highlighted for evaluation–theoretical background, practical application, and evaluation of oneself and one's successes–improved on average compared to the beginning of training and did not statistically differ from each other when comparing the two training formats. However, it is worth clarifying that one cannot unequivocally assert an improvement in training because the training period was short and the sample of participants in the experiment was small. These two assumptions can be addressed by further work to evaluate the implementation of these and other courses in the microlearning format. At the same time, the feedback results show deep satisfaction with both the disciplines as a whole and the new proposed learning format. This result of the work, although it is a subjective evaluation, is nevertheless important and revealing, as it demonstrates the demand for courses in this format.

The prospects of this work are broad, both in terms of the possibility to apply the microlearning format to other suitable disciplines, and to expand soft skills training opportunities not only for ITMO University students, but also for other people when launching such a course for general use. This learning format is scalable and can be used in a variety of courses if it suits them–due to the merits of the format, there are many possibilities for its application. In addition to the two disciplines conducted, two more modules using the microlearning format have already been developed (including video content shot and edited): "The Practice of Creativity" and "Financial Competence".

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Commission for Intra-University Surveys and Ethical Assessment of Empirical Research Projects at the National Research University Higher School of Economics. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2023.1177516/full#supplementary-material

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