CHEMISTRY OF TEACHERS

2020 IMPACT REPORT

Öğretmenin Kimyası

DOW

ÖĞRETMEN AKADEMİSİ VAKFI

CONTENTS

INTRODUCTION

In a constant flow of new and updated information, Covid 19 resulted with a new shift in education. Technology is now more efficiently used in education and online sessions are now a part of our life in addition to face-to-face sessions. Students are not at schools and laboratories, a major part of science education, are used on a limited scale. **Chemistry of Teachers** training was designed online based on online efforts of teachers and students. Students need 21st century skills to discuss, question facts and come up with new solutions through various methods (observation, document review, open-ended and close-ended tests, group discussions, etc.). These methods were used remotely during Covid 19 and training programs were prioritized to use materials available at homes. They will learn what they can do with these materials and use them. Events designed in this concept were supported with Web 2.0 tools.

As explained in 2023 Education Vision Document, "21st century skills" are now global norms which are not optional. This approach is focused on creativity, communication, collaboration (through online apps) and critical thinking. **Chemistry of Teachers** program has an interdisciplinary focus on 21st century skills. The basis of our program includes **STEM** education and applications which is a major global issue.

ABOUT THE PROGRAM

Chemistry of Teachers Training Program developed by **Öğretmen Akademisi Vakfı (ÖRAV - Teachers' Academy Foundation)** is managed in collaboration with Dow Turkey and the Ministry of Education. Designed for science and chemistry teachers, the program focuses on Science, Technology, Engineering and Mathematics (STEM) education and applications. The program is about research-based inquisitive learning, efficient laboratory applications, and the integration of technology tools with the lectures. These are offered to allow teachers to a cognitive experiencing of the process and increase their motivation about the working conditions. 1,157 teachers attended the trainings under the project launched in 2013. Face-to-face systems started in the 2020-2021 semester and an online program was developed after the Covid-19 pandemic.

PROGRAM'S OBJECTIVES

After this training, participants will;

STEM Approach

- Understands that science effects and is needed by all.
- Has a general understanding of the **STEM** approach.
- Experiences **STEM** integration to lectures.
- Learns about 21st century skills.
- Creates a lecture plan based on the **STEM** approach.

Integration of Technology with Education

- Learns about using animations in education.
- Understands the impact of mobile apps in education.
- Creates an animation/video in line with lecture achievements.
- Understands that mobile apps can be used for instant feedbacks at lessons.
- Learns to use Stop Motion, Kahoot, Elements 4D apps.

Laboratory Applications in Chemistry/Science Education

- Understands the importance of laboratory applications in chemistry education.
- Understands the features of a laboratory application designed with the structured inquiry method.
- Understands the features of a laboratory application designed with the guided inquiry method.
- Compares laboratory applications with varying levels of inquiry.
- Learns to decide which laboratory applications to use under certain conditions and manage them.

Research & Inquiry-Based Applications

- Understands the importance of inquiry.
- Develops own claims in case of problems.
- Designs experiments to acquire data to support claims.
- Supports claims based on data.
- Understands skills developed by students through research & inquiry-based applications.
- The training program is designed to employ experimental learning methods and encourage active participation of the trainees. Some of these methods and techniques are as follows:

  - Pen talks
  - Brainstorming
  - Discussions
  - Group works
  - Shared reading
  - Posters
  - Project presentation
  - Laboratory applications
  - Presentation techniques
  - Web 2.0 tools
  - Games (warm-up and team games)

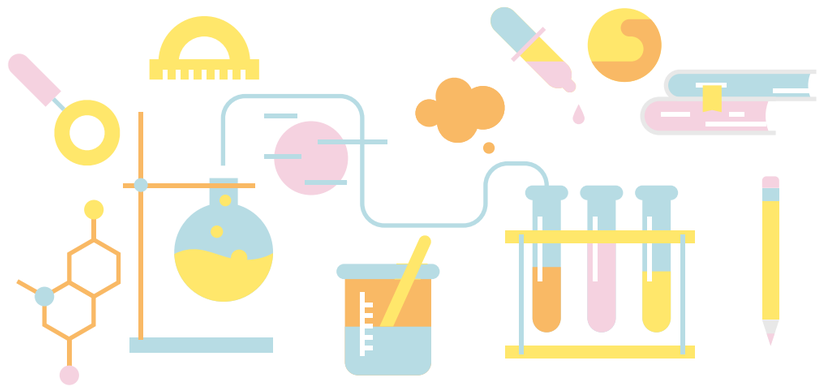
The training program used to include two days of face-to-face sessions and eight training sessions. After COVID19, the sessions are now online. The details of this version are shared below.

ABOUT E-CHEMISTRY OF TEACHERS PROGRAM

The purposes of **Chemistry of Teachers Training Program** include helping science and chemistry teachers offer efficient laboratory applications for their students and integrate technology tools into education as well as raising awareness on contemporary literature and sample applications.

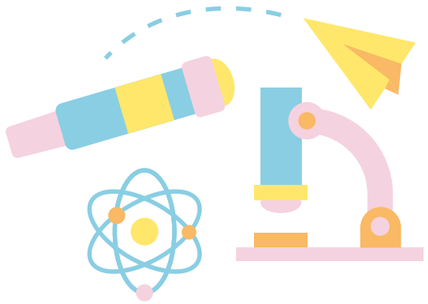
Achievements,

- Sees how to relate the topics of science lectures with real-life issues.
- Understands the importance of observation and experiments for a continued learning process.
- Explains that science effects and is needed by all.
- Relates **STEM** and 21st century skills.
- Explains how engineering and design processes are used in **STEM** education.
- Explains **STEM** integration to lectures.
- Learns about how student-focused efforts are conducted in 5E learning.
- Creates a lecture plan based on the **STEM** approach.
- Explains the importance of animation in education.
- Explains the security measures required at laboratories.
- Explains the importance of laboratory applications in science education.
- Understands varying approaches for laboratory applications in science education.
- Understands skills developed by students through research & inquiry-based applications.



Subjects:

- Introduction to chemistry program, what is STEM?
  - Real Life Examples: Chemistry at the Kitchen
  - What is Stem?
  - 5E Learning Methodsi



- STEM Education & Features / Use of Technology in Lectures
  - Relation of STEM & 21st Century Skills
  - Engineering Design Processes
  - STEM Lecture Plan
  - Use of Animation / Simulation in Lectures

- Laboratory Applications
  - Security Measures at Laboratories
  - Purpose of Laboratories in Chemistry / Science Education
  - Why Do We Test?
  - Surface Tension / Soap Foam Test
  - Various Approaches to Laboratory Applications
  - Closed-End Tests
  - Open-End Tests
  - Hypothesis Tests

- Research & Inquiry-Based Applications
  - Argumentation in Science Education

We conducted online training evaluation surveys to receive feedbacks of the participants on benefits, general satisfaction and trainers. The surveys are on teaching skills of the trainers, contents, practices and the benefits for the participants. The surveys are conducted with a scale of "fully agree, agree, neither agree nor disagree, disagree and fully disagree" and SPSS and Excel are used to analyze the data. Open-ended questions are used to receive a general assessment of the participants.

The training evaluation survey was implemented on the last day and responded by **208** of **222** teachers **(94%)** who participated. Impact details of the analysis of the respondents are explained below.

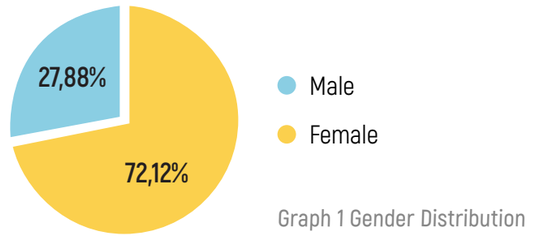
DEMOGRAPHIC DATA

Gender Distribution of Participants

Gender distribution of teachers who participated in the online program are **72%** female and **28%** male.

Gender distribution graph is below.

Gender Distribution:

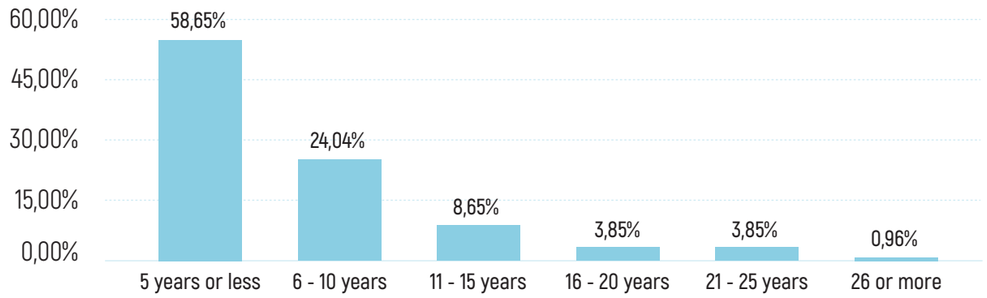


Graph 1 Gender Distribution

Distribution of Participants by Professional Experience

The time of professional experience of most of the participants **(59%)** is "5 years or less". **24%** of the participants have "6 to 10 years" of experience. All groups are detailed in the graph below.

Professional Experience:

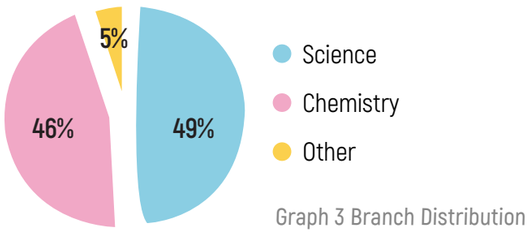


Graph 2 Professional Experience

Branch Distribution of Participants

The target audience of **E-Chemistry of Teachers** is chemistry and science teachers. The participants are distributed as **49%** science teachers and **46%** chemistry teachers. **5%** of the teachers are science and technology, biology etc. teachers (other category). Branch distribution graph is below.

Branch Distribution of Participants:

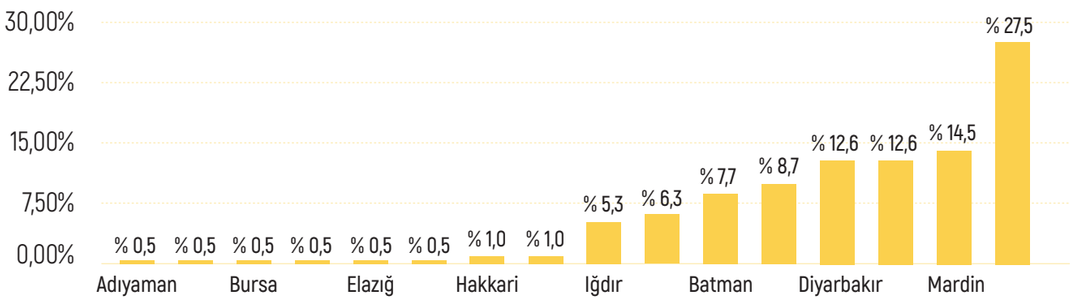


Graph 3 Branch Distribution

Province Distribution of Participants

27.5% of the participants of **E-Chemistry of Teachers** training program in **2020** were from Ağrı. Ağrı was followed by Mardin in **14.5%**, Erzincan and Diyarbakır with **12.6%**. Distribution of participants by province is provided in detail in the graph below.

Province Distribution of Participants:

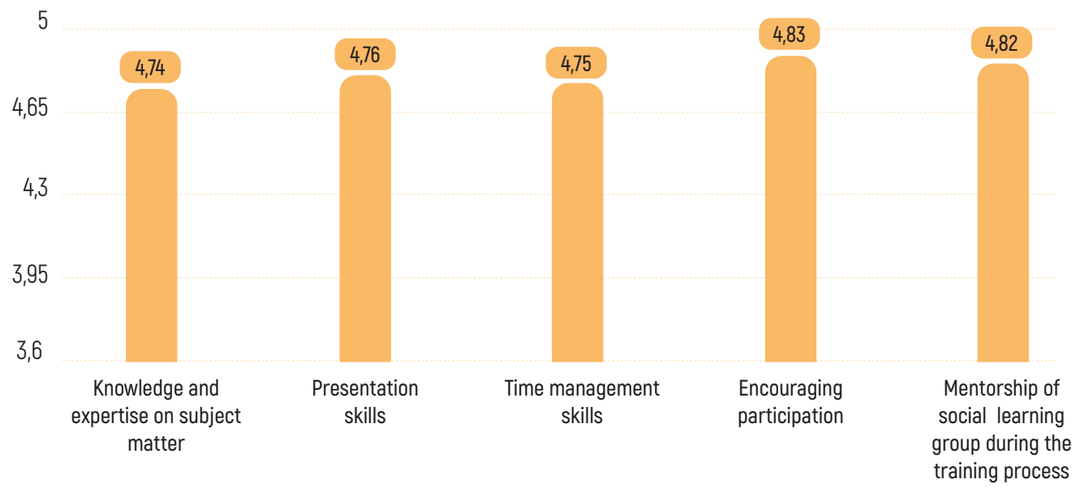


Graph 4 Province Distribution

Evaluation of Participants on Trainers

ÖRAV offers trainings with two trainers for each group. This results with a better-quality and more effective training as well as more collaboration among colleagues. **Online E-Chemistry of Teachers Training Program** uses the same approach. Participants evaluate the trainers in a number of categories including "expertise on the subject matter, presentation skills, time management, encouraging participation and mentorship of social learning group" and average scores are quite high. Responds to the items of the Training Evaluation Form are given in the graph below.

Evaluation of Trainers:



Graph 5 Evaluation of Trainers

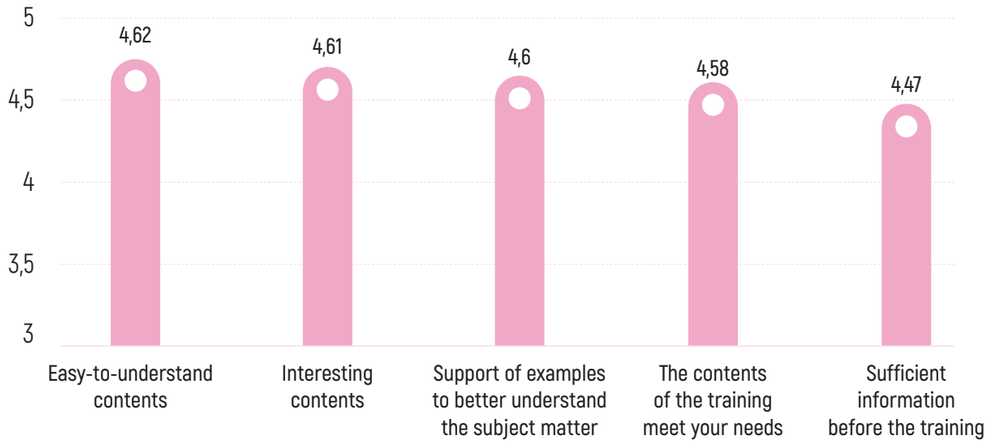
In this section, the total of "fully agree-agree" responses exceeds **98%** for each category. In terms of the skills of trainers, the highest category was "encouraging participation" with a score of **4.83** over 5. Encouraging participation is usually the highest-voted category. The power of **ÖRAV** trainings comes from active participation. This is followed by "mentorship during the training process" with **4.82**.

Evaluation of Participants on Training Content and Method of Implementation

In this section, participants evaluate the subject method and the implementation of the training.

In this category, most of the responses are "fully agree or agree". The objectives of the events and applications in the **E-Chemistry of Teachers** training include encouraging better interaction between the participants and boost learning experience. Certain interactive tasks are employed to make the participants feel like a part of the training and create a group dynamic. This is to ensure active engagement of the participants. Responds to the items of the **Training Evaluation Survey** are given in the two graphs below.

General Evaluation of the Training I:

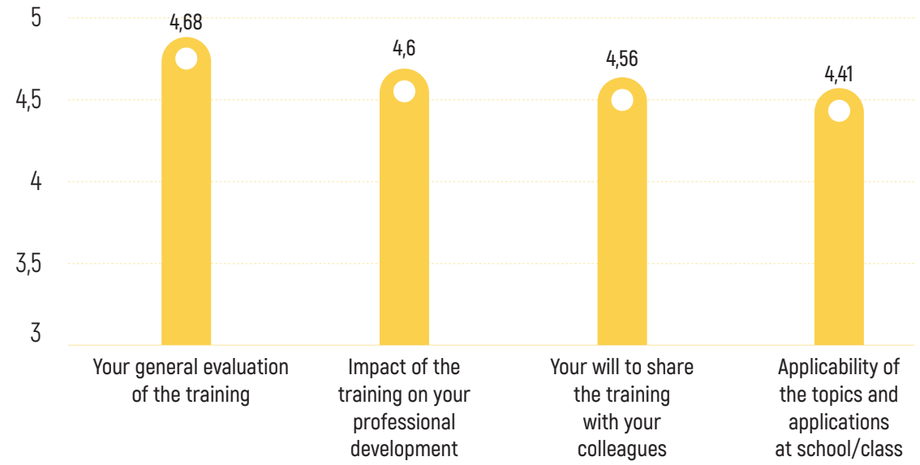


Graph 6 General Evaluation of the Training I

The highest-rated category of this scale is the ease of interpretation of the contents with **4.62**.

This is followed by "interesting contents" with **4.61** and "support of examples to better understand the subject matter" with **4.60**. **Chemistry of Teachers** training program was made online this year and new subjects and objectives were added to help them achieve their objectives through remote education. Consequently, "the contents of the training meet your needs" was rated **4.58**.

General Evaluation of the Training II:



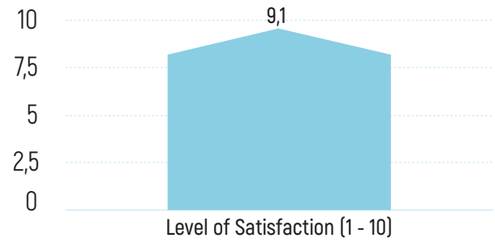
Graph 7 General Evaluation of the Training II

This is followed by "general evaluation of the training" with **4.68** and "positive effect of the training on professional improvement" with **4.60**. These are followed by "your will to share the training with your colleagues" with **4.56** and "applicability of the topics and applications at school/class" with **4.41**.

The will to share a training by its direct beneficiaries with their colleagues is a major social influence factor. Here, the attendance score of **4.56** and the factor score of **0.9** is important.

Teachers' Academy Foundation started asking general satisfaction about a training program or activity in **2020**. Participants share their general opinions about the program on a scale from 1 to 10. As displayed in the graph below, general satisfaction score is 9.1 over 10, meaning **91%** satisfaction.

General Satisfaction:



Graph 8 General Satisfaction

Evaluation on Achievements Gained Through the Training

In this section, participants evaluate the extent they reach their pre-defined objectives through the training.

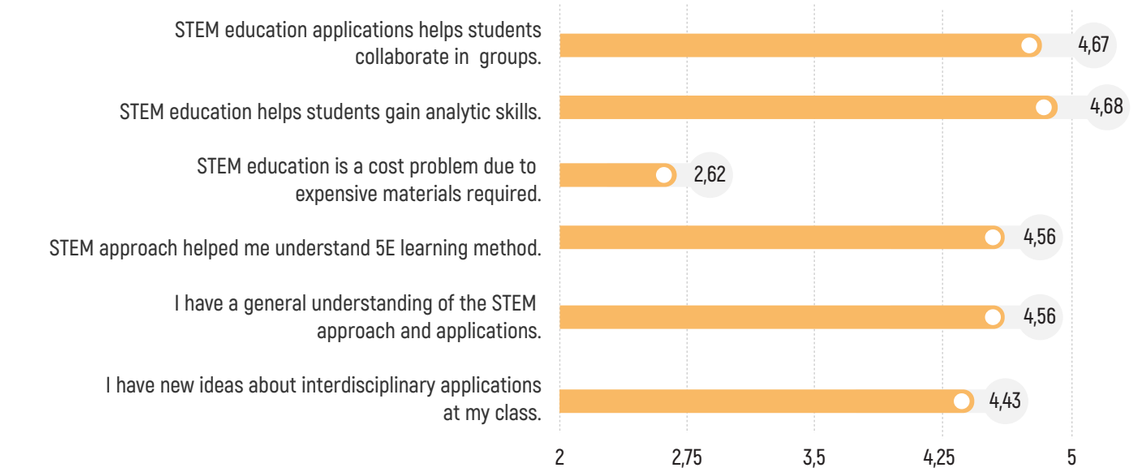
It can be seen that the participants think that they have reached their objectives to a major extent.

The first scale is about information and opinions on **STEM** education and interdisciplinary applications.

Furthermore, the accuracy of the item on **STEM** was verified with an item with incorrect information.

This was a control group question about the high cost of **STEM** education. Scale details and scores are shared in the graph below.

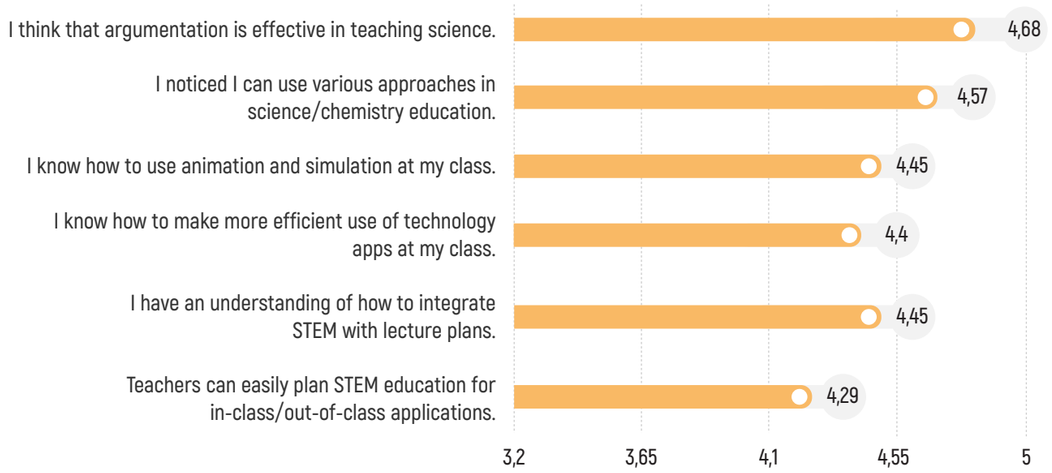
Content of Evaluation & Achievements I



Graph 9 Content Evaluation & Achievements I

The average of the responses in the graphic above shows that the achievement objectives of the participants are met to a significant extent. The graph shows that almost all participants have reached their objectives in the sessions about how to use the applications, how to integrate them to the classes and design the learning flow. The phrase that **STEM** education helps students gain analytic skills is top-rated with **4.68**. Furthermore, **STEM** approach and applications teach teachers on how to use 5E education method and interdisciplinary applications in general. The phrase that **STEM** education is expensive and requires high-cost materials confirmed the focus of the responders with a low score of **2.62**.

Content Evaluation & Achievements II:



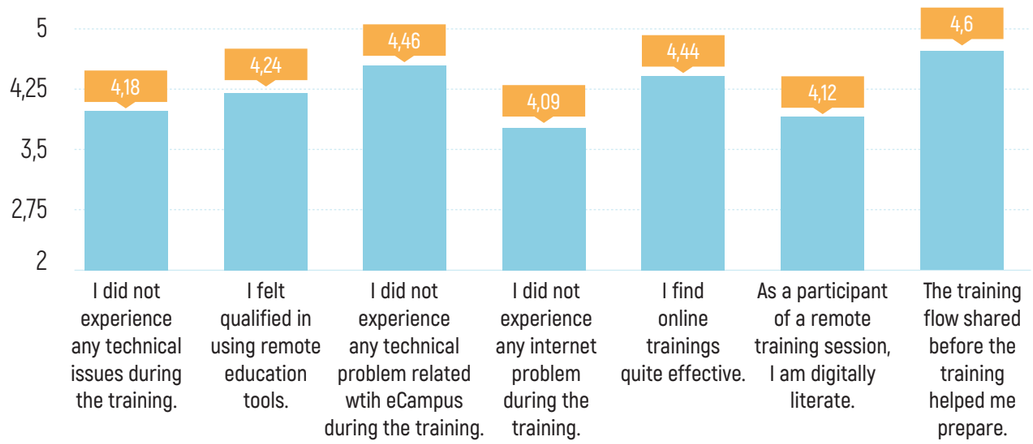
Graph 10 Content Evaluation & Achievements II

The second graphic on the benefits of the training is about use of animation and simulation at classes, importance of games in education, training based on research-inquiry and laboratory applications. High-rank items include efficiency of argumentation with **4.68** and use of varying approaches in laboratory applications with **4.57**. It is observed that participants have a major interest in **STEM** approach and argumentation and are effected by this approach. This will be explained in detail in further sections.

Technical Evaluation of Participants on the Training

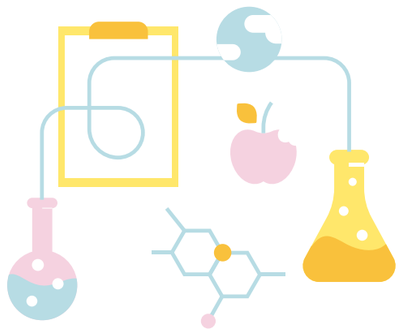
Due to measures and limitations resulting from the pandemic this year, the program was made online in a session about how the training is developed in terms of technical issues. This section is about technical, technological and internet-related problems and positive score is high. The average of these phrases is given in the graph below.

Technical Evaluation of the Training:



Graph 11 Technical Evaluation of the Training

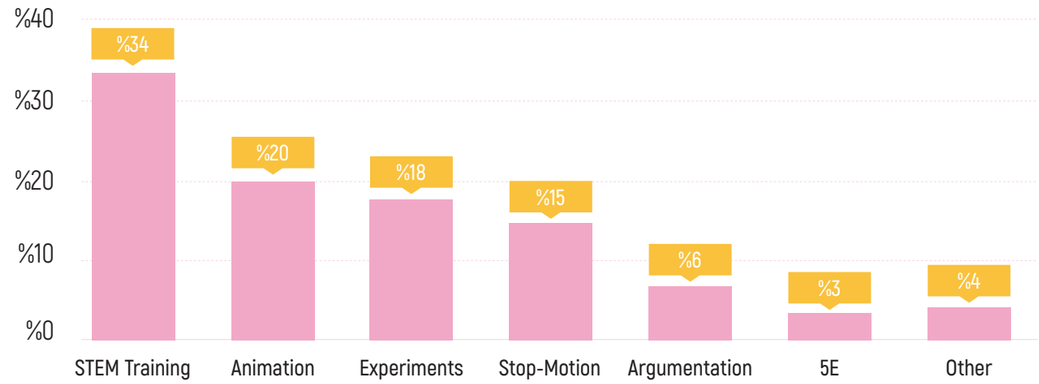
The highest scores are about content shared at the beginning of the training is helpful by **4.60**, no technical problems are experienced at eCampus with **4.46** and online training is helpful with **4.44**. A major issue is digital literacy and the participants think that "digitally literate" with a score of **4.12**.



Participants' Top-rated Subjects and Applications They Consider Using in Their Classes

This section of the survey consists of open-ended questions about which subjects participants find more useful. Participants responded as subjects as well as the methods used. Responses are classified with theme analyses and the results are given in the graph below based on frequency.

Top-Rated Topic/Application/Method:



Graph 12 Top-Rated Subject, Application, Method

The most useful subject of the **E-Chemistry of Teachers** is considered to be **STEM** Education. **STEM** approach had the highest ranking in the previous years and teachers are very much interested. A majority of the participants say that they are impressed by the interdisciplinary approach, learning methods and technology offered by **STEM**. Second top-rated application is the "animation" with the frequency of **20%**. This is followed by tests with **18%** and "stop-motion" with **15%**. These are followed by argumentation and 5E applications. **4%** of the participants say that they find the training very useful as a whole without a specific focus on any method or application and they will use them at their classes.

Contributions of the Training on Professional Development

An open-ended question in the post-training survey asks the participants how this training contributes to them professionally. The extent the training contributes to the participants in terms of professional and personal development is displayed in the graph. However, reliability of responses and satisfaction of the participants are required for future training programs. Therefore it is important that these are defined.

The responses here help the participants professionally from a number of angles.

The following sections are the opinions of participants on how the training helped them professionally.

> It was a very efficient training in terms of professional development, a well-planned presentation and a cozy atmosphere. Thank you very much.

> It was efficient in terms of awareness and understanding my misinterpretation of certain concepts. It helped us gain self-confidence and integrate certain applications and technologies to our lectures. It supported us to make achievements with simple tools.

> It is a good feeling to learn new things. I came to know about ÖRAV at this training. I hope this will be a new start for me. I feel excited to help my students with what I experienced here.

> I know have a better perspective. I learnt about various sites and applications. I felt dynamic and active during the training.

> I noticed that I did not have sufficient knowledge on a number of topics. I used animation for the first time and sharing them with my students will help a lot.

> As a science teacher, I was reminded about the importance of experiments, whether large-scale or small-scale, thank you.

> Despite my young age, I was a 20th century teacher before this training. A lot will change as of this Monday and I took a major step forward thanks to you.

> With the current advances in technology, we now have a different generation of children and we also have to make progress. It was an efficient learning experience for me. I learnt a lot and I will use them.

> I saw that I can make progress and help my students, consequently the society better.

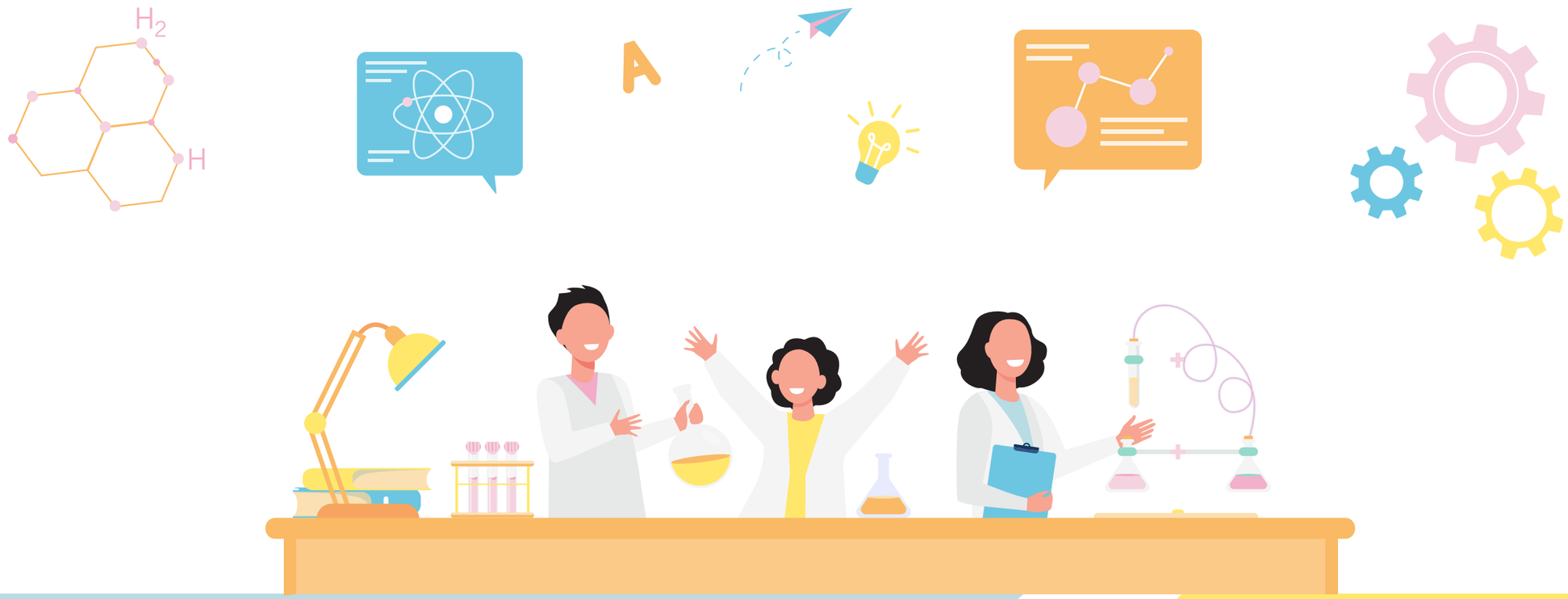
> I noticed that I can make use of innovative events at my class and use STEM application to help myself and my students more creatively.

CONCLUSION AND SUMMARY EVALUATION

This section is about general assumptions, results and requirements related with **2020-21 E-Chemistry of Teachers Project**. **Chemistry of Teachers** project combines chemistry education with tests in an effort to encourage individuals engage in interdisciplinary work. Students and individuals will also match theory with daily life and make use of their daily practices in learning chemistry. The most significant measure resulting from the pandemic in 2020 is remote education. **Chemistry of Teachers** training helps teachers in terms of digital literacy, designing and managing online lectures.

Based on the results of the evaluation survey and the executive managers, the teachers are more focused on implementation, technology tools, training methods and techniques rather than contents. The results show that the participants are informed and curious about **STEM** education and applications, think on how to implement interdisciplinary works in their classes, understand how to use animation-simulation and gaming to ensure an efficient education.

Content and technical evaluations of the training by the teachers show that they think the training will have a positive impact on their professional and individual improvement. In the section of open-ended questions, participants say that they find the methods and subjects useful for the education and they will use what they learn at their classes. The teachers also focus on the need to design classes, finding contents and developing methods for remote education. Teachers evaluate that more online tools are required in training. They also need other training sessions to improve themselves on this issue. Evaluations and feedbacks by the participants show two basic requirements. These are **more tests and applications in education and longer training time**. In addition to these requirements, certain teachers requested an online platform to present new tests, animations and apps as well as provide a means of communication. Teachers are also happy to meet **ÖRAV** as well as **Dow Kimya** through these trainings.



Opinions of Participants / Teachers

ÖRAV brings teachers from the same department together and helps us share new applications.

My school wanted me to attend, it was not optional. However, I noticed how effective it was during the process. I have worked for private schools for 16 years and I just started to work for the public school system. I have a lot of experience, yet I feel refreshed. We had good trainers with a cozy attitude. I think that these events should be shared with school managers and teachers through regional education directorates. People see attendance as extra work and this is a problem. Non-optional education in certain branches would help a lot on a national scale. Thank you, and I wish you the best.

I gained academic and up-to-date information. I enjoyed even the music. Thank you **ÖRAV**, thank you Burcu and Fuat.

I would recommend that these events are promoted on a larger scale. Thank you for offering the opportunity.

I wish that this kind of training is offered to all teachers.

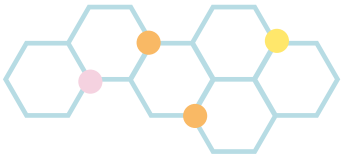
Online trainings will help teachers who would otherwise face transportation issues.

It was a high-quality remote training session. **ÖRAV** is the best in remote education. We feel valued and it helps us improve in our profession.

ÖRAV offers good contents. This helps us improve, both personally and professionally. Thank you.

We need more training, especially in science. It was very useful, bot for us and for the students.

We went through both synchronous and asynchronous training, not just theory but also practice. In general, I have a very high opinion. My thanks to our trainers.



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