International Journal of Education Research and Development
https://e-journal.yayasancec.or.id/index.php/corolla
eISSN: 2775-3689; pISSN: 2775-4766

Study of the Fatigue of Chemistry Teachers in the Last Hours of Teaching the School Program in the Classroom

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Abstract. This paper examines the fatigue of the Chemistry Teachers who teach the Science of Chemistry in the first grade of high school in Greece. Twenty secondary school teachers aged 40-50 who teach first grade during the last two hours of the program participated in the study. In this research, significant problems were found in teaching and teacher fatigue and serious conclusions can be recorded about teaching the last two hours in the school. Also searched how the students participated in the previous hours of the weekly program in the last two days of the week. Teachers feel tired in the previous hours and it seems that it is difficult to teach chemistry science. They do not have the ability and time to participate in any laboratory experiments with the students. Founded that students are very tired in the last two hours. It turns out that they would like more hours of Chemistry in the weekly schedule for the first grade and think that it is difficult for the students to pay attention to the Chemistry teaching. Also in the last hours, many students leave the school. The research recognizes that it is much better to have chemistry lessons in the first hours of the school schedule rather than the last hours, also to have more time in the first grade for the chemistry lesson so that the teachers can use laboratory experiments with the students and to have more time for teaching.

Keywords: Chemistry, teaching fatigue, educators, curriculum

Introduction

We must examine modern teaching methods by generating ideas and discovering methods that the student can be led to discover in the chemistry lesson. However, this is not always possible in today's school because the first-grade program includes many different subjects and lessons. To become a reality not only for students but also for teachers there should be the appropriate tools and practices that allow the student to discover new knowledge in every educational hour in the classroom (Schizas, D., &Psillos, D., 2019). This can help students become more attentive in class and attend with more enthusiasm and interest.

We know very well that natural sciences can combine many more lessons and not only chemistry and even give additional explanations for different daily problems. For this reason, chemistry we could say is a holistic science and in a spirit of cooperation with many other lessons taught at school, which can describe many current problems such as environmental pollution, the chemistry of the atmosphere, the chemistry of food, and the general functioning of the body, for example, the usefulness of metals, proteins, and others.

One of the important tools of teaching Chemistry in the classroom is to make connections between natural sciences with reality and its application in everyday life (Sumarni, et al., 2023). To do this, students should spend many hours in laboratory experiments where they will be able to understand chemistry in its roots and

Article info:
https://doi.org/10.52760/ijerd.v4i2.56
Received 24 June 2024; Received in revised form 10 August 2024; Accepted 24 October 2024
Published by Corolla Education Centre Foundation on behalf of International Journal of Education Research and Development.

applications and be able to conclude more easily in different applications in their daily family and social life. With this method they will be able to connect theory with practice and better understand the phenomena of Chemistry and its Laws. They will also be able to participate more effectively in the lesson with questions and to receive scientific answers. This way will allow them to love the lesson teachings and to follow with more convenience and interest without feeling bored. Natural science is based on and analyzed through observation and experiment. Through these two methodologies and by using mathematical formulas the laws and the phenomena of chemistry science as they established in the past years become easier, especially for young children in school (Christian Tarchi, 2014).

Students today are facing very big innovative technological changes so they think and participate in learning in a different way than the past years. So many of the lessons taught in the school today do not seem very important to them. In their daily life, they find different problems than those students had about ten years ago (Chen & Xu, 2020)

One most important problem that exists in the school's curriculum is the large number of different lessons, many of which are theoretical and refer to the main language, philosophy, and history, and lessons that are not so similar to the Natural Sciences (Wibowo, et al., 2023). During the daily program in the school unit, especially in the first hours of the program, the students get tired of watching and participating in various lessons which most of them do not have any direct application in today's modern environment (ShailaBanu, 2011).

So, they get more and more tired, and in the last hours of the program, they are not able to watch and be more focused and have the same willingness to attend courses that require more attention and combinatory thinking. It also stated by Ghanizadeh & Royaei (2015), they stated that tired has negative consequences of work and wellbeing, and make people start thinking to quit ((Goddard & Goddard in Daniel & Van Bergen, 2023).

It is also very important to look more closely at the daily schedule of the different lessons, so students will have the possibility to combine knowledge and different ideas of learning during the same day at the school (Darling-Hammond, L., 2020). This is what gives us the possibility to search for other different modern methods of teaching, different than the ones we apply today. This is very important because in this way we allow our students to participate with the same interest and commitment as in the first hours of the lessons and to be more interested in learning until the last hours of the program in the school (Amerstorfer, C. M., & Freiin von Münster-Kistner, C., 2021).

It is also very interesting to note that in the Greek school, there is not enough time for experiments and not many hours for the Natural science lessons. Of course, there are many laboratories, but it is not possible to do experiments with a total number of teaching hours of Chemistry only two a week for the first grade of high school.

Material and Method

For the research were selected high school Chemistry Teachers from Greece who voluntarily and anonymously participated in the research completing the questionnaires given to them from the first week.

This paper refers to research in a group of 20 Physics Teachers with ages between 40-50 years old who teach in public and private schools in Greece. Teachers had a daily program teaching no more than 4 to 5 hours of classes on the same day. The teachers, most of them 12 teach in public schools and 8 in private classes. All the twenty teachers returned the completed questionnaires in three weeks. The research was done

during the last three weeks of November of the year 2023 when approximately there were about two months that have passed since the beginning of the educational school year.

The main direction of the research was the attempt to study the fatigue of the teachers during the last two hours of the educational program in the school in the first-grade classes of a high school and the ability of the students of the A-Class of the Lyceum to follow with interest and enough mood.

The direction of the research was to record the problems that arise concerning the fatigue of teachers in secondary education at the high school during the teaching of Chemistry lessons (Cohen, L., et al., 2011). This was the area that which the research specialized to receive information.

In this direction for the research, a questionnaire was created to investigate the fatigue of teachers' and students' behavior to combine and extract important results. With this questionnaire, we tried to record the fatigue of the teachers' and students' interest and to study the factors that influence and increase it concerning the Chemistry lesson. The research questionnaire was given to the Teachers at the beginning and asked to return the answers after three weeks. The questionnaire consisted of ten questions which are shown below from 1 to 10 total.

Table 1
Questionnaire

Indicator	Sub-Indicator	Questions
Teaching Load	Weekly teaching hours	1. How many hours a week do you teach first-grade Chemistry?
Classroom Demographics	Class size	2. How many students usually study in every class?
Teacher Fatigue	Level of fatigue during late hours	3. How tired did you feel during the last two hours of the program?
Teaching Effectiveness	Self-assessment of performance	4. What is the level you perform in Chemistry class in the last two hours?
Student Engagement	Perceived attention from students	5. How much do you think your students watched your teachings in the last two hours?
Interest in Experiments	Anticipated impact of experiments on student interest	6. If you present experiments to your students do you think that would follow with more interest?
Student Attendance	Average student absences in the last hours	7. On average, how many students leave school in the last two hours?
Content Engagement Preference	Preference for discussing chemistry topics in late hours	8. Would you prefer to discuss some Chemistry topics with the students in the last hours?
Optimal Teaching Schedule	Preference for early vs. late teaching sessions	9. Do You think that you would be more effective in teaching if you had a Chemistry class in the first hours of the curriculum?

Recommended Teaching Duration	Suggested maximum teaching hours for first-grade Chemistry	10. What is your suggestion for the maximum number of teaching hours in the first grade?

Results and Discussion

Results

The answers of the Questionnaire inducted in the diagrams for every question

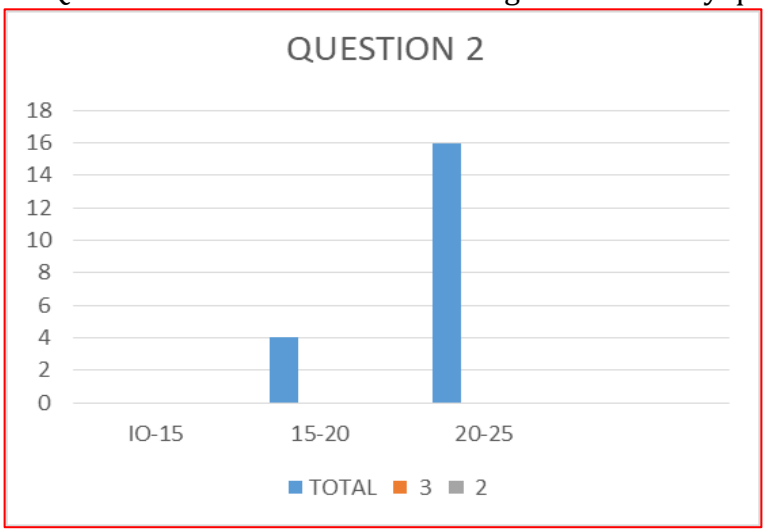

Figure 1. Question 2 responses

Based on the diagram above, it can see that the students who attended the classes to study is about 15 to 25 students in each class.

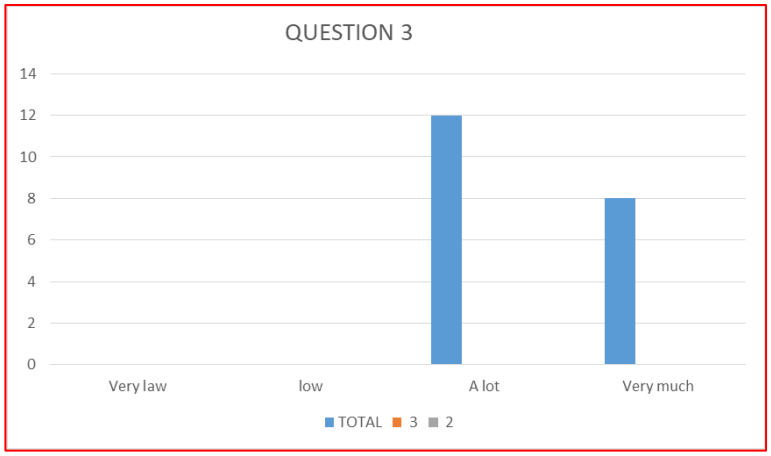

Figure 2. Question 3responses

Based on the diagram, it can conclude that the teachers in last two hours really feel tired in teaching. It can see that there are many of teachers answer the question with “a lot” and “very much”.

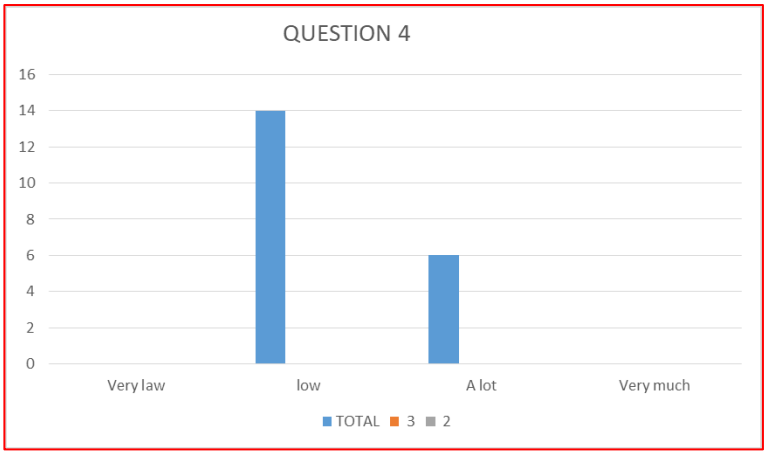

Figure 3. Question 4 responses

According to the diagram, it can see that the teachers during last two hours of chemistry class had a downgrade performance. It can be proved that most of teachers answer the question with “Low”.

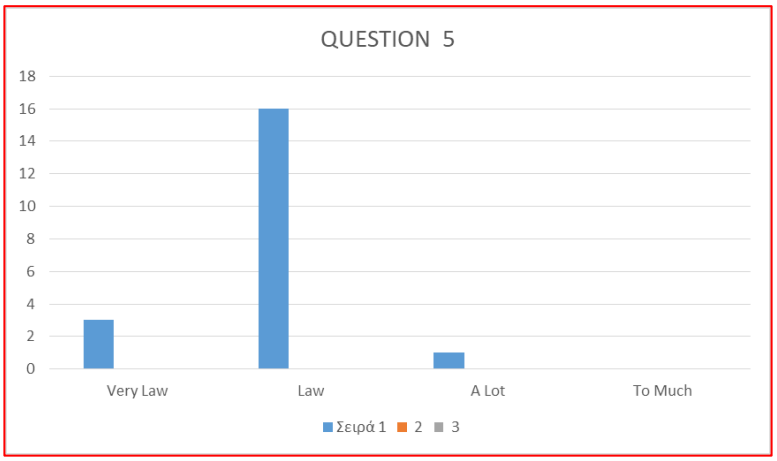

Figure 4. Question 5 responses

Based on the diagram, the students have low attention during the last two hours of chemistry class. The rest of students had very low attention.

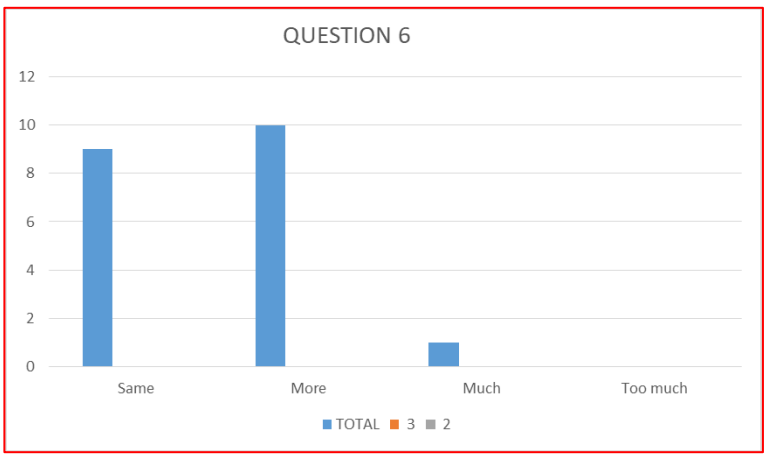

Figure 5. Question 6 responses

According to the diagram, it can see that most students feel more interest when the teacher gave an experiment study in the class.

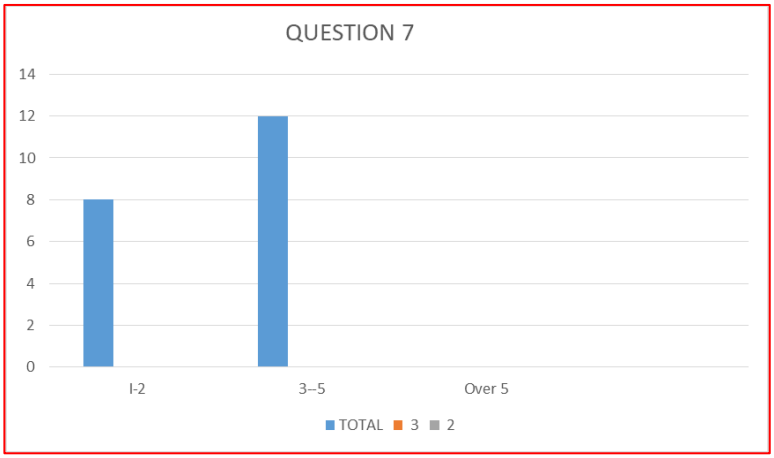

Figure 6. Question 7 responses

During the last two hours of chemistry class, it can see from the diagram that there is no many students who left the class. It is just about one to five students.

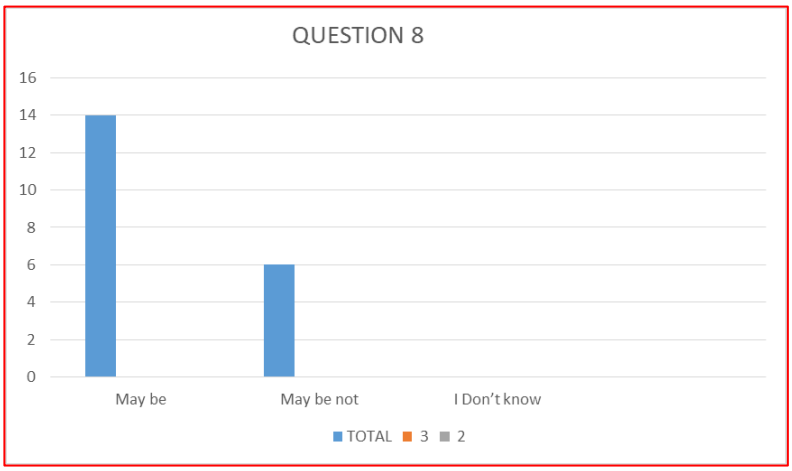

Figure 7. Question 8 responses

Based on the diagram, the students feel hesitation when the chemistry class should conduct a discussion in the last hours of the class.

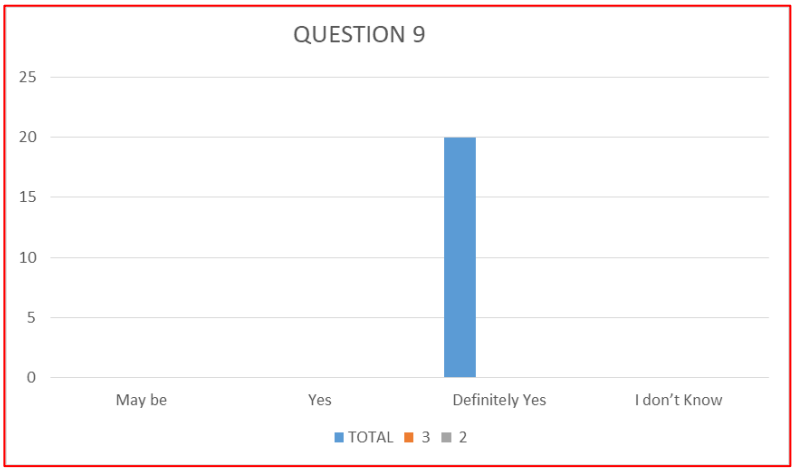

Figure 8. Question 9 responses

All chemistry teachers said “yes” to have chemistry class in the first hour of curriculum; it is proved by the diagram above. It means that the teachers really want to have the chemistry class in the first hour.

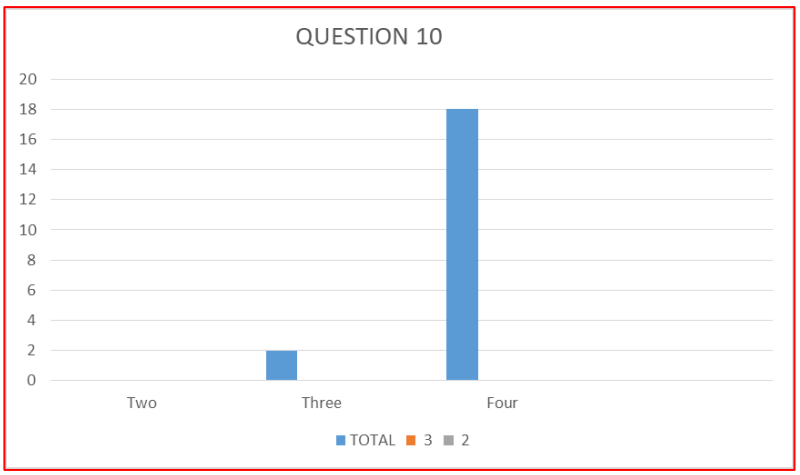

Figure 9. Question 10 responses

Based on the diagram above, it can see that most of teachers want four hours to teaching and learning process for chemistry class in the first grade. Meanwhile, the other teachers wanted to have three hours.

Discussion

It is very important to see the results of this research. Among the very important conclusions that emerge is that the teachers feel tired from the indifference of the students and also from the long hours of teaching. Kyriacou in Madigan & Kim (2021) stated that being a teacher is a profession that fully of stress. This is likely expected considering the numerous challenges and pressures teachers face daily (McCarthy, Lambert, Lineback, Fitchett, & Baddouh, 2016), such as student misconduct, heavy workloads, and regular performance assessments. Moreover, we also see that the students do not have the same desire to attend the Chemistry lesson in the last hours of the school schedule. It is also important that the teachers consider that the two hours in the program for the first grade of high school are not enough to help students understand and learn Chemistry and to participate with the students in any experiment in the school laboratory.

Teachers feel tired in the last hours and it seems that it is difficult to teach Chemistry science. They do not have the ability and time to do laboratory experiments with the students because of the fewer hours given by the program. As stated by Capone, Joshanloo, & Park (2019); Hakanen, Bakker, & Schaufeli, (2006), tired can encompass shifts in mood and overall wellbeing, evidenced by heightened irritability and signs of mental health issues. Also, it is important to recognize that the students are very tired in the last two hours of the daily school program. It turns out that they would like more hours to spend on the Chemistry lesson in the weekly schedule for the first grade and think that it is difficult for the students to pay attention to the lesson in the last hours. It is very important to recognize that in the last hours, many students leave the school, so next time they can't understand the lesson very easily and they are late in concepts and theory.

The research recognized that it is much better to have Chemistry lessons in the first hours of the school schedule rather than the last hours and also to have more time

in the first grade for Chemistry so that the teachers can use laboratory experiments with the students and have more time for teaching (Shana, Z., & Abulibdeh, E. S., 2020). To make it more meaningful, students must be able to understand the mathematical and application relationship that exists behind every law of chemistry and must be able to connect physical facts, laws, and phenomena to be able to conclude.

In the first class, some students spoke the same mother language, and some students no more than 5 in each class spoke at least one different language. Teachers were often forced to explain the phenomena and the laws of Chemistry in two languages, Greek and English. This method of teaching created an additional problem for the students because many of them were not able to understand the second language well.

This may be the case with students who could not attend the lesson that was taught in the main spoken language of instruction (Lena Hansson and Lotta Leden (2016)). This, according to the teachers, created additional mental fatigue especially when the lessons were held in the last hours of the curriculum. It would be very important not to have classes with students who speak two different languages in the same course. It is very important and serious to have lesson plans where students can speak and understand the same language so that they don't have to leave school sometimes.

Conclusion

This research highlights several critical factors affecting both students' and teachers' engagement with the Chemistry curriculum. Teachers experience fatigue from the long teaching hours, exacerbated by scheduling Chemistry lessons in the final hours of the school day when students are also noticeably tired and less attentive. The lack of sufficient class hours and practical laboratory sessions further impedes students' comprehension and active participation in the subject, making it difficult for them to grasp foundational concepts and apply them effectively. Additionally, the linguistic diversity within classes adds another layer of complexity; having to alternate between languages strains both teachers and students, which impacts the clarity and effectiveness of instruction, particularly when it occurs late in the day.

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