Aug 10th, 12:00 AM

# Online Learning Fatigue in Schools During the COVID-19 Pandemic – An Empirical Study with High School Students

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# Online Learning Fatigue in Schools During the COVID-19 pandemic – An Empirical Study with High School Students

*Completed Research*

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## Abstract

The COVID-19 pandemic has had a significant effect on every age group, including high school students. They were forced to be constantly connected to ICTs in online lessons instead of attending in-class lessons. A consequence of the continuous exposure to ICTs is the occurrence of technostress enhancing individuals' emotional exhaustion. As part of this research, the effect of emotional exhaustion on high school students is studied. A survey that was carried out within schools in Austria and Germany with 592 participants shows the effect of emotional exhaustion as a driver for students' online learning fatigue. Online learning fatigue is characterized as lower mental and operational effectiveness to learn and study online. These findings can be used in research and practice to improve students' lives during these times.

**Keywords**

Online learning fatigue, COVID, technostress, emotional exhaustion.

## Introduction

Politics, media, and research alike all controversially discussed the effects of constant connectivity on young students in schools in the German-speaking region during the COVID-19 pandemic (e.g., Anger & Pluennecke, 2020). Due to online classes being enforced because of school closures following lockdowns, students had to spend a lot of time online and still have to due to issues of quarantine. As many schools still cannot operate normally, online classes are and will be an inevitable way of teaching students. But having to be online constantly working with their computers during online classes profoundly affects students (e.g., Penado Abilleira et al., 2020; Pozas et al., 2020; Wang et al., 2020). Studying the effects induced by constantly being online on students' wellbeing and learning experience is an important responsibility for our society and a necessary task for researchers in the information systems (IS) field.

Information and communication technologies (ICTs) are inevitable and important tools in today's world for most people, but it is well known that they have positive and negative effects on humans' wellbeing. Technostress is one of the factors that can be caused due to constant connectivity (Tarafdar et al., 2007), becoming even more an issue as the time people spend online increases. This is especially relevant during times of online classes.

Molino et al. (2020) have found that constant connectivity during the COVID-19 pandemic has caused technostress in organizations, so one can assume that the same could happen in schools. Furthermore, it has been discovered that a lack of motivation in students is a cause of online classes imposed due to lockdowns (Pozas et al., 2021). However, even before the COVID-19 pandemic has begun, constant connectivity has been an issue (Wajcman & Rose, 2011), with technostress being thoroughly studied by researchers such as Tarafdar et al. (2019). They have discovered the need to further research this topic and have created a framework for it.

The importance of studying how the younger generation deals with these issues is clear due to the fact that the effects of today's usage of ICTs also has an impact on how this generation develops and grows up. Even though children nowadays have to deal with constant connectivity and technostress just like adults do, little research has been done on analyzing its effects on younger generations, so far. Emotional exhaustion (EE) due to online classes needs to be studied since it can cause a lack of motivation (Pozas et al., 2021) or could even go as far as causing online learning fatigue (OLF). We define online learning fatigue as students' lowering mental and operational effectiveness to learn and study in online classes. While studies have been done on "Zoom fatigue", the exhaustion brought about by video conference meetings (e.g., Nesher Shoshan & Wehrt, 2021), actual online learning fatigue has not been studied extensively, yet.

As studying online may be detrimental for students' mental health and cause emotional exhaustion (George et al., 2018), we are addressing this research gap by conducting an empirical study to investigate the impact of constantly being connected to ICTs for students. The focus lies on online learning fatigue that could be caused by emotional exhaustion due to online classes. The corresponding research question is: ***How does emotional exhaustion influence online learning fatigue in high school students during the COVID-19 pandemic?***

The paper is structured as follows. First, we provide background information on the building blocks of this research. This is the basis for the hypotheses development where we derive our hypotheses based on prior research. In the methodology part, we describe how the survey's data was collected and we give information on the demographics of the survey's respondents. After that we provide the results of our measurement and structural model in the subsequent section. As part of the discussion, we outline our contribution to research, provide implications for research and practice, as well as discuss limitations and potential fruitful avenues for future research.

# Research Background

## *Stress-strain-outcome model*

The stress-strain-outcome model devised by Koeske and Koeske (1993) is used as basis for this research. The model includes that a stressor leads to strain, which then will have a certain outcome (Koeske & Koeske, 1993). In the case of this research, technostress stressors lead to emotional exhaustion, which in turn leads to online learning fatigue.

## *Technostress*

Technostress is the increased stress individuals feel due to an excessive ICT use. Although the use of ICTs has immensely influenced the work of individuals in a positive way, there is also a negative factor that needs to be considered. Factors such as work overload and role ambiguity are influenced by the usability, intrusiveness and dynamism of technology (Ayyagari et al., 2011). Furthermore, technostress negatively affects people's productivity levels and furthers role stress (Tarafdar et al., 2007).

Most of the literature is focused on the negative aspects of technostress instead of techno eustress (Tarafdar et al., 2019). For example, technostress can develop with the constant pressure to gain new technical skills in order to be up to date regarding the latest technologies, which affects employees negatively (Wang et al., 2008). Stress caused by ICTs can indirectly affect mental health issues such as burnout or depression (Reinecke et al., 2017).

Students are not taken out of the conversation about technostress in schools and universities. The increased use of ICTs in learning environments has positive (such as better performances), yet also negative effects on students (Qi, 2019). Technostress in schools and universities should not be forgotten (Qi, 2019). So far, technostress has been more thoroughly researched in students over the age of 18 at universities instead of school students. Technostress can be perceived "as a product of imbalance between demands (abilities) and resources (needs), in addition to being influenced by the behavior of other students" (Penado Abilleira et al., 2020, p. 6). An effect of technostress can be burnout, which leads to worse performances by students in technology-enhanced learning (Wang et al., 2020).

### *Online Learning Fatigue*

During the COVID-19 pandemic several types of fatigue due to increasing technology use have appeared. For example, “Zoom fatigue” is the phenomenon of individuals being exhausted due to being on video calls for an extended amount of time. It is partly caused by “experiencing loss” (Nesher Shoshan & Wehrt, 2021, p. 14) which implies that people miss how real-life meetings used to be. Even though the people can be seen on screen, it is still not the same as a meeting in reality. Further causes of “Zoom fatigue” can be technical problems which can cause the people on the other side to be annoyed and can produce stress for individuals (Nesher Shoshan & Wehrt, 2021). These reasons can also be applied in school settings, where students miss interacting with both teachers and students like they used to do and where they can have problems with their gadgets, which could cause teachers to get frustrated.

If teachers do not manage to create “binge-worthy” courses that are interesting enough so that students watch them as intensively as they do their favorite television series (Ebner & Greenberg, 2020), they might experience online learning fatigue. In this situation, their mental and operational effectiveness is lower than it used to be before online classes, making it difficult for students to perform like they previously did.

The motivation to learn is what drives students to perform well in courses, which is why it is so important next to their enjoyment of studying. However, it strongly depends on the students’ instructional immediacy, which is behavior that makes the students feel “physically or psychologically closer” (Kelly & Fall, 2011, p. 45) to their teachers. This can be extremely difficult to achieve in online classes, which possibly causes online learning fatigue.

### *COVID-19, Online Classes and Their Effects on Education*

The COVID-19 pandemic has affected most organizations worldwide. Governments have imposed lockdowns or quarantines and thus disabled individuals from performing their work or school tasks in their traditional way. Working or studying from home has become the new normal for a lot of people. Remote working has led to technostress, according to a study carried out by Molino et al. (2020), using the Technostress Creators Scale (Tarafdar et al., 2007). Moreover, the crisis also significantly affected education with the move to online classes, making online communication vital to function. The pandemic changed how teachers and students communicate with each other. Online classes were not only introduced in universities but also in primary schools, middle schools and high schools worldwide. This has led to a variety of challenges for students.

Students and teachers face similar challenges relating to online classes and COVID-19. The positive and negative aspects of online classes, as well as vulnerable topics, are the same for them, as found by Popa et al. (2020). Positive aspects of online classes include the newly learned ICT skills. However, those are outweighed by the negative factors such as the quality of material the students are given and exams and their evaluation (Almomani et al., 2021).

Less focus has been put on how students are affected in regard to their schoolwork or their online classes. However, a study conducted in Mexico and Germany found that primary school children are less motivated due to online classes during the COVID-19 pandemic (Pozas et al., 2021). In this case, teachers are often the person responsible for addressing these new special needs while also having to cope with the new situation themselves. Not only do students' academic needs need to be dealt with, but students also have personal social and emotional needs that did not exist in the same way before pandemic-related online classes (Darling-Hammond & Hyler, 2020).

The effect of the COVID-19 pandemic and its need for school closures and working from home has had a significant effect on people worldwide, including students. Therefore, it is important to gain more information on how students are affected by the pandemic and the changes it has brought about.

## Hypotheses Development

To evaluate the impact of online classes on students, different hypotheses were derived. The hypotheses were developed to execute the empirical part of this research, which is a survey carried out in schools. Arens and Morin (2016) characterize emotional exhaustion as "feelings of emotional overstrain and reduced emotional resources" (p. 800). Moreover, emotional exhaustion is a primary component of burnout

(Halbesleben & Bowler, 2007). The effects of technostress, in terms of techno overload (TO), techno complexity (TC), and role overload (RO) as introduced by Tarafdar et al. (2007) on students' emotional exhaustion and the effects of emotional exhaustion on online learning fatigue represent those causal relationships that are the intellectual core of our study.

With regard to the individual technostress creators, techno overload makes individuals perform their work faster in order to cope with the stress. This, in turn, leads to them being more exhausted because they are forced to do more work more in the same time (Tarafdar et al., 2007). In online classes, students are forced to change their work patterns in order to cope with technologies and thus have to work faster as well because they first have to get used to the new surroundings. This need to work faster can cause stress and thus exhausts students. Therefore, we hypothesize the following:

H1a: The higher the techno overload in online classes, the higher the emotional exhaustion.

Techno complexity causes people to "feel inadequate as far as their skills are concerned" (Tarafdar et al., 2007, p. 315), and it also means that it makes them take more time in order to fulfill their tasks. Furthermore, there exists an inability to improve skills due to the complexity of the technologies. Therefore, individuals become exhausted due to the fact that they spend more time on their tasks and still feel as though they are not progressing on a personal or professional level (Tarafdar et al., 2007). Transferring this reasoning to school settings, students in online classes might feel like they are unable to perform well due to how complicated the systems are and therefore cannot keep up with the standard they had before online classes. That is a cause for exhaustion since they spend more time on their work while feeling unable to perform like they used to. Thus, we hypothesize:

H1b: The higher the techno complexity in online classes, the higher the emotional exhaustion.

Role overload deals with the fact that individuals have to take care of too many tasks which are too difficult at the same time (Tarafdar et al., 2007). This can clearly cause exhaustion in people since they have to perform on a level, they are unable to. In online classes, students can also have this problem because of the novelty of the situation at first and the fact that the teachers still expect the same level of professionalism of the students. This, in turn, leads to the students being exhausted. Consequently, we hypothesize that:

H1c: The higher the role overload in online classes, the higher the emotional exhaustion.

Online learning fatigue is a topic that is vital to do research on due to its omnipresence and importance in today's everyday life and society. Loosing motivation and enjoyment of doing schoolwork due to online classes is crucial to discover more about since it influences students profoundly. De Oliveira Kubrusly Sobral et al. (2022) have done a study on online learning fatigue in regard to medical students and have found that students want to be alone after online classes, showing that they are fatigued. If students have lower mental and operational effectiveness in studying and learning in online classes, their performance and grades might deteriorate, which in turn has an effect on their future and their knowledge. Students who are emotionally exhausted due to online classes may experience higher online learning fatigue because they are unable to perform like they used to, are less motivated and cannot perform their work in the same time like they used to. When students experience emotional exhaustion, their mental effectiveness is strained even further and their physical and cognitive efficiency (which is needed in class to pay attention and learn) is reduced. Thus, we hypothesize that:

H2: The higher the emotional exhaustion in online classes, the higher the online learning fatigue.

# Methodology

The purpose of this research is to analyze the relationship between different factors influencing students and emotional exhaustion. A list of constructs, including at least three items each, was created to measure the latent variables. The items were partly taken and adapted from existing literature (Tarafdar et al., 2007; Ayyagari et al., 2011) and partly self-developed based on scale development and q-sorting procedures with high school teachers. Exploratory factor analysis (EFA) was conducted since the items regarding the construct online learning fatigue are self-developed. The items were measured on a five-level Likert scale, ranging from "I completely disagree" to "I strongly agree". Appendix A includes the items as well as their factor loadings. They all exceed the limit of 0.5 which is needed to be "practically significant" (Hair et al. 2019, p. 151), and all but one item exceed 0.7 which is recommended for factor analysis.

### *Data Collection*

The tool LimeSurvey was used to create and carry out the survey. A corresponding link was sent to the schools' headmasters or teachers in Austria and Germany, who then passed on the link to their students. This resulted in 804 questionnaires returned to the researchers. Of these 802 questionnaires, 212 questionnaires were not filled out completely, which means that 592 questionnaires were returned in full. Thus, the survey has a response rate of 74%.

### *Demographics*

The average age of the students who filled out the survey was 16.38, with the youngest student being 14 years old and the oldest being 21 years old. The majority (82%) of the questionnaires were filled out by female students. Only 14% of the questionnaires were filled out by male students. Additionally, 4% of the questionnaires were completed by individuals who chose the option "No answer" with regard to their gender. The high percentage of questionnaires being filled out by female students can be traced back to the fact that 46% of the participants were students at a secondary school for economic professions, which is a type of school often dominated by a female student body in Austria. 32% of the students attended a regular high school, and 22% are students at a secondary school for technical professions.

## Results

The 592 completely filled-out questionnaires were used to test the hypotheses. To do so, they were analyzed with structural equation modeling applying the software SmartPLS (Ringle et al., 2015). The results of our measurement model and structural model are described in the following subsections. Age and gender were included in the structural model as control variables.

### *Measurement Model*

To test for the reliability of the reflective first-order constructs in our research model we checked for Composite Reliability, Cronbach's Alpha, and AVE (Chin, 1998). As seen in Table 1, all the variables meet the threshold of 0.5 for AVE. Cronbach's Alpha is higher than the threshold of 0.7 as well except for Techno Overload. Furthermore, Composite Reliability is higher than the recommended threshold of 0.7 for each construct (Chin, 1998).

| | AVE | Cronbach's Alpha | Composite Reliability |
|---|---|---|---|
| Online Learning Fatigue | 0.758 | 0.839 | 0.904 |
| Role Overload | 0.669 | 0.754 | 0.858 |
| Emotional exhaustion | 0.790 | 0.911 | 0.938 |
| Techno Complexity | 0.647 | 0.820 | 0.880 |
| Techno Overload | 0.552 | 0.602 | 0.785 |

**Table 1. AVE, Cronbach's Alpha and Composite Reliability for the model**

In order to test discriminant validity, Table 3 shows the Heterotrait-Monotrait ratios and their p-values. Henseler et al. (2015) discuss that discriminant validity is established for values below either 0.85 or 0.9 and all of the values lie below these thresholds. Therefore, discriminant validity is not an issue.

| | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (\|O/STDEV\|) | P Values |
|---|---|---|---|---|---|
| OLF -> EE | 0.663 | 0.663 | 0.033 | 20.124 | 0.000 |
| RO -> EE | 0.612 | 0.618 | 0.037 | 16.565 | 0.000 |
| RO -> OLF | 0.442 | 0.445 | 0.048 | 9.278 | 0.000 |
| TC -> EE | 0.586 | 0.586 | 0.035 | 16.630 | 0.000 |
| TC -> OLF | 0.606 | 0.606 | 0.039 | 15.638 | 0.000 |
| TC -> RO | 0.666 | 0.668 | 0.036 | 18.251 | 0.000 |
| TO -> EE | 0.693 | 0.693 | 0.044 | 15.685 | 0.000 |
| TO -> OLF | 0.626 | 0.628 | 0.049 | 12.664 | 0.000 |
| TO -> RO | 0.730 | 0.732 | 0.048 | 15.087 | 0.000 |
| TO -> TC | 0.738 | 0.739 | 0.041 | 17.937 | 0.000 |

**Table 3. Heterotrait-Monotrait ratios**

### *Structural Model*

The $R^2$ values for emotional exhaustion and online learning fatigue are 0.413 respectively 0.337; thus, the model explains 41.30% of the variation in emotional exhaustion and 33.70% of the variation in online learning fatigue. As shown in Figure 1, the path coefficients between all techno-stressors and emotional exhaustion are significant. Therefore, H1a, H1b, and H1c are supported. This means that the higher the respective techno-stressors in online classes, the higher the emotional exhaustion. Regarding emotional exhaustion and online learning fatigue, there also exists a significant effect. This means that the higher the emotional exhaustion due to online classes, the higher the students' online learning fatigue. Consequently, H2 is supported. We also controlled for age and gender. While age has a significant effect on emotional exhaustion, gender does not. With increasing age, students get increasingly emotionally exhausted.

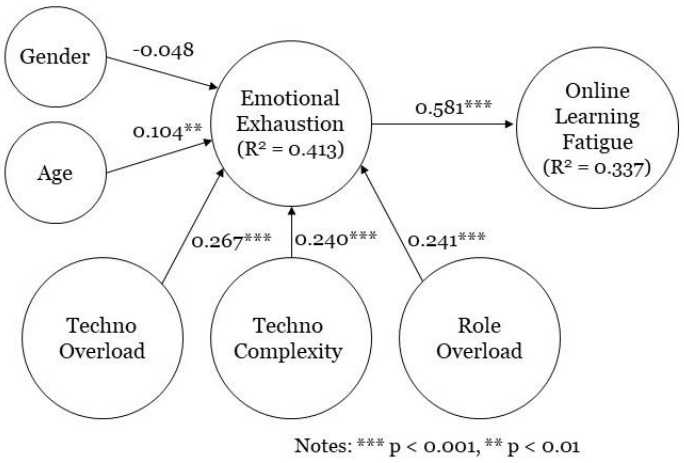


**Figure 1. Structural model evaluation**

## Discussion

### *Contributions*

This research aimed to discover the relationship between students' emotional exhaustion in online classes and online learning fatigue. The findings of this research are relevant for researchers who are dealing with

the impact the COVID-19 pandemic has on individuals, as well as for educators all over the world who are interested in how the pandemic has influenced students. As shown in the previous chapter, the data analysis supports both of the hypotheses, which unveils important findings.

First of all, the analyses of techno overload, techno complexity, and role overload show that technostress positively affects emotional exhaustion. Hypothesis 1 is therefore supported. The technostress that employees experience, according to Tarafdar et al. (2007) and Ayyagari et al. (2011), negatively affects students and furthers emotional exhaustion. This research contributes to the technostress literature due to its focus on high school students, who are generally excluded from studies that focus on employees (e.g., Tarafdar et al., 2007), teachers (e.g., Estrada-Muñoz et al., 2020), or university students (e.g., Penado Abilleira et al., 2020). For instance, Qi (2019) discovered that "students' academic usage of mobile devices does not significantly influence technostress creators" (p. 1349). Qi (2019) explains that university students are "digital natives" and therefore are not influenced by technostress, but this is not the case in this research. High school students might be expected to be even more digitally native and having grown up with ICTs, which is why they, according to Qi (2019), also would not experience emotional exhaustion due to technostress. However, the survey results indicate that technostress furthers emotional exhaustion among this age group. Moreover, while other studies (e.g. Vladova et al., 2021) have shown that there is acceptance of technology-mediated teaching in certain university courses, one must still differentiate between high school students and university students. High school students, as shown in this study, do not seem to be ready to cope with online classes and they lead to emotional exhaustion.

Further, this research shows that emotional exhaustion due to online classes leads to online learning fatigue in students. Hypothesis 2 is therefore supported as well. This shows that not only “Zoom fatigue” (Nesher Shoshan & Wehrt, 2021) is an issue worth discussing, but also online learning fatigue is an important factor to take into consideration. This contributes to the research on online classes and its effects on students.

This research contributes to the literature on the effects of technostress as well as emotional exhaustion. As discussed in the introduction, technostress is an issue worth researching further (Tarafdar et al., 2019), and this paper contributes to the research on this topic. Furthermore, emotional exhaustion due to online classes and its effects is a highly relevant issue in the era of the COVID-19 pandemic (De Oliveira Kubrusly Sobral et al., 2022) and therefore also needs to be studied, which has been done in this research. The fact that emotional exhaustion due to online classes and technostress leads to online learning fatigue is an important contribution that this research provides to the literature.

## *Implications for Research*

This study shows that technostress caused by ICTs and their use in the school system during the COVID-19 pandemic can affect students’ emotional exhaustion. By paying regards to our study, it is vital to decrease technostress in online classes. It would be important to further research this topic and how technostress can be decreased, because it has substantial value not only for designing education in schools but also for many similar settings where individuals are affected by a crisis-driven digital transformation (Di Gangi et al., 2021) in today’s world. COVID-19 and its effects are so impactful in many different aspects of daily lives so researchers should focus on it and its implications. The ramifications of the crisis are becoming increasingly visible in everyday life, so it is key to further research this topic in the future. Researching this subject more thoroughly would be significant because of its meaning for the everyday life of students.

Moreover, the fact that emotional exhaustion due to online classes leads to online learning fatigue in students also has important implications for research. This is why the effects of technostress and emotional exhaustion need to be recognized by researchers and need to be further researched. Students are less motivated, enjoy learning less and take more time to perform their tasks due to emotional exhaustion, which can have negative effects for their present learning experience and their future life in general. Since these issues are likely not the only problems that arise due to online classes, further research on the effects of technostress and emotional exhaustion is necessary. The effects of online classes during the COVID-19 pandemic need to be studied more extensively in order to discover what can be done to improve students’ experiences and their lives during these times in general.

It has been discovered that emotional exhaustion causes online learning fatigue in the studied age group. However, further research could include students of different ages, such as those who are older than 18 and

enrolled in universities or younger children. Even employees who are in training might experience online learning fatigue, which could also be studied. Furthermore, emotional exhaustion is possibly not the only cause of online learning fatigue. This could be a topic of further research as well. Finding out other triggers of online learning fatigue could help to understand this issue even better and to find ways to combat it.

### *Implications for Practice*

The rise in digitalization will affect students even after the COVID-19 pandemic and thus, it is important to take into consideration what teachers can do to limit emotional exhaustion in students. Using laptops in in-class lessons, for instance, is going to become more and more common in high schools due to digitalization. Teachers must therefore ensure that they still keep up routines that were the same before the rise in digitalization to decrease students' anxiety levels.

As online learning fatigue includes a lack of motivation, teachers need to take action to prevent this from happening to increase productivity, for example, by increasing the attentiveness of students in online classes by using "sticky" teaching methods (Robinson & Cook, 2018). For instance, teachers could use online tools that enable them to create quizzes to keep students engaged and active. This would give students the opportunity to participate in online classes in a fun, different way and it could show them that online classes can be interesting. Moreover, it could show them that studying with new technologies does not have to be a burden.

Furthermore, a measure that teachers could take to boost motivation is to encourage students to switch up the environment they study in. An example would be to tell students to study outside for a change if the weather and the students' situations allow it. This could boost both productivity and motivation due to the fresh air and could enable the students to feel less online learning fatigue.

### *Limitations and Future Research*

There are some limitations that need to be considered when interpreting this research. First of all, the study was conducted in Austria and Germany only, which means that results could look different in other countries. Different cultural upbringing and attitudes towards online classes could be a reason for this. It would be of great value to further research this topic because of its importance in today's world by, for example, including more age groups. Surveying elementary school students or middle school students would be a vital contribution to the literature on how students perceive the COVID-19 pandemic concerning their online classes and emotional exhaustion. Further research of younger cohorts would be a valuable contribution. Furthermore, expanding the survey to reach more students from different parts of the world and comparing the results would also provide valuable insight. For example, cross-cultural studies could be a good way to compare how different cultures perceive the COVID-19 pandemic and its impact on students. Longitudinal studies with high school students would be interesting as well, since they could show how the emotional exhaustion due to online classes changes over time.

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## Appendix A: Survey items and respective factor loadings

| **Items** | **Factor loadings** |
|---|---|
| **Techno overload – adapted based on Tarafdar et al. (2007):** | |
| Online classes force me to work with a tight schedule. | 0.629 |
| I am forced to change my habits related to school in order to adapt to online classes. | 0.788 |
| I have more work to do at school due to greater difficulty in online classes. | 0.800 |
| **Techno complexity – adapted based on Tarafdar et al. (2007):** | |
| I do not know enough about online classes in order to fulfill my tasks to my teachers' satisfaction. | 0.704 |
| It takes me a lot of time to understand online classes. | 0.842 |
| I do not have enough time to improve my skills in online classes. | 0.813 |
| I often find it difficult to understand everything in online classes and to implement it. | 0.851 |
| **Role overload – adapted based on Tarafdar et al. (2007):** | |
| I often have to do more tasks than I can handle. | 0.850 |
| I often have to take care of difficult tasks. | 0.796 |
| I often deal with many problems or tasks at the same time. | 0.808 |
| **Emotional exhaustion – adapted based on Ayyagari et al. (2011):** | |
| I feel drained from online class activities. | 0.880 |
| I feel tired from my work in online classes. | 0.880 |
| Working the whole school day in online classes is a burden for me. | 0.877 |
| I feel burned out from my work in online classes. | 0.918 |
| **Online learning fatigue – self developed based on scale development and q-sorting procedures with high school teachers:** | |
| Online classes make me less motivated to learn. | 0.879 |
| I enjoy learning less than before. | 0.917 |
| I need more time to complete my assignments now than before the online classes. | 0.814 |