

Original Article

System usability, stress and mood among teachers using distance learning

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Abstract

Introduction: Literature on teachers' stress and depression over the past two years is vast, conversely, evidence regarding relationships between system usability and mood is relatively small. The present cross-sectional study aimed to explore system usability, stress, and mood among teachers using distance learning (DL).

Methods: A digital protocol containing socio-demographic data, the Depression Anxiety Stress Scales (DASS-21), the System Usability Scale (SUS), and three qualitative questions on DL was administered to 106 Italian teachers (89.4% of women; spanning from 27 to 67 years old; mean age in years 47.10 ± 10.23).

Results: Linear regression showed that there were no statistically significant effects of age, gender, and school grade. Stress was significantly correlated with anxiety and depressive symptoms, while DL usability was negatively correlated with stress, anxiety, and depression.

Discussion and Conclusions: Teachers showed high acceptance of the DL. However, it was characterised in predominantly mild but negative terms. Our findings highlight the psychological impact of the massive DL on teachers' mood and stress levels, as well as differences in perceived ease of use of the system, suggesting the need for tailored and blended didactic strategies.

Key words: Anxiety, Depression, e- Learning, Stress, Teachers, System Usability.

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INTRODUCTION

In recent years, teaching and learning have changed rapidly, moving away from traditional face-to-face teaching to a mix of conventional and online methods [1]. The Covid 19 pandemic maximised the use of these technologies by overcoming the problem of restrictive policies that did not allow

face-to-face teaching. As a result, teachers, although having relative knowledge of e-learning before COVID-19, had to transfer their pedagogical activities to online platforms [1–4]. This aspect posed a pedagogical challenge to maintain their support for student learning [5–8]. After this experience, the online platform, Moodle modules and other innovative tools have become part of the daily classroom reality and are shared between teachers and students. Therefore, teachers have had to use digital tools and resources to solve problems and promote new approaches to teaching and learning [9]. However, many schools need to catch up to the expected progress in transforming information and communication technologies (ICT) in schools [7–9].

Several studies have shown that the challenges of integrating ICT, such as online teaching and online assessment, are poorly met by teachers. Other factors, such as adaptation and self-efficacy, were crucial for good-quality learning [10]. Teacher self-efficacy was important for student learning. These findings confirm research that emphasises the importance of teacher competence in achieving relevant educational goals [11]. Digital literacy also played an important role: in one study, only 48% of teachers reported using ICT for teaching on a daily basis at school [7]. This means that teachers who already had software resources and were familiar with their use in the classroom benefited from these tools in their work. Several studies in China found that teachers exposed to e-learning showed great anxiety [12–14]. In addition, socio-demographic factors such as age, gender, educational status, type of teacher, school location, and behavioural status may influence perceived anxiety [12]. Chilean teachers have been shown to significantly decrease their perception of quality of life due to work overload from distance learning [15]. In Italy, a decrease in teachers' self-esteem and self-efficacy was observed in e-learning. In addition, high school teachers showed mild stress, anxiety and depression: Stress and depression are the most important predictors of satisfaction with distance education [16]. Other protective factors related to the e-learning experience were coping, locus of control and self-efficacy [16–18]. Finally, Casacca et al. indicated that university lecturers reported sleep problems and depressive symptoms related to their online teaching experience [19]. The aim of this online survey was to investigate the psycho-emotional impact of distance learning (DL) on teachers.

METHODS

Study participants and procedure

We conducted a cross-sectional survey to assess the psychological impact of DL on teachers during the outbreak of COVID-19. The protocol was sent via instant messaging apps (e.g. WhatsApp, Facebook) or e-mail. Potential study participants were identified through the school files of the main primary and secondary schools across Italy after prior contact with the study director, who informed the teachers about the research objectives. Inclusion criteria were: i) the use of DL and ii) the fact that they were teachers in the early stages of their careers. Data collection was conducted from October 2020 to January 2021. They completed the questionnaires in Italian via an online survey platform ("Google Form", Google LLC), which was accessible via a simple link. The study complies with the principles of the Declaration of Helsinki, and all participants gave informed consent. Anonymity was ensured by the online form, where the data were password protected and only managed by the person responsible for the research.

The final sample consisted of 106 teachers (89.4% women, between 27 and 67 years old; mean age in years 47.10 ± 10.23). They worked in primary schools (16.9%), lower secondary schools (14.2%), upper secondary schools (61.3%) and universities (7.5%).

Study instruments

The data collection form consisted of three sections. The first consisted of a structured interview on the teacher's socio-demographic data (gender, age, education, city where they teach, grade level). The second section included a psychological battery to assess the psychological impact of DL on teachers, including DASS-21 and SUS.

The Depression Anxiety Stress Scales (DASS-21) by Bottesi et al. (2015) is a questionnaire validated on the Italian population, consisting of 21 items on a 4-point Likert scale from 0= "Does not apply to me at all" to 3= "Applies to me very often or most of the time". The DASS-21 provides three subscales for depression, anxiety and tension/stress. The scale showed reasonable internal

consistency with a Cronbach's alpha coefficient of 0.87 for depression, 0.80 for anxiety and 0.89 for stress [20,21].

The System Usability Scale (SUS), developed by Brooke in 1995, is a quick and reliable method for assessing the usability of design solutions. In the present study, it was applied to DL to assess effectiveness (achievement of goals), efficiency (cost and effort) and satisfaction (satisfactory experience). The instrument consists of 10 items and is based on a 5-point Likert scale that provides a global overview of the subjective usability assessment. Scores above 50.0 indicate good usability of the device [22,23].

The third part consisted of three qualitative questions about DL from the teacher's point of view, i.e. i) to what extent he/she considers DL useful for training and assessing students ("very useful", "useful", or "not very useful"); ii) whether he/she considers DL equivalent to the traditional teaching method ("yes" or "no"); iii) whether he/she would like DL to be used more in the future ("yes" or "no").

Data analysis

Descriptive statistics were analysed and expressed as mean ± standard deviation or median ± first third quartile for continuous variables; frequencies (%) were used for categorical variables. Clinical scale scores were expressed as mean and standard deviation, and perceptions of questionnaire usability were expressed as percentages. We used linear regressions to calculate the univariate relationship between the perceived stress level related to the DL and the scales' rating. All tests were two-sided tests with a significance level of p < 0.05. Statistical analysis was conducted using SPSS Statistic 26.0 (IBM SPSS Statistics, Chicago, Illinois) [24].

RESULTS

One hundred and six participants were enrolled in the study, and all of them completed the online questionnaire. The tool was easy to use, and no significant difficulties were encountered. As shown in Table 1, teachers showed high stress (DASS-21 S mean 8.45 ± 5.9).

Table 1. Average of the clinical scale of teachers.

Scale	Mean ± SD	Rating	Cut-off
DASS-21 S	8.45 ± 5.9	Mild	>17
DASS-21 A	3.86 ± 4.8	Normal	>10
DASS-21 D	5.00 ± 5.3	Mild	>14
SUS	62.83 ± 19.1	High	<50

Note: DASS-21 S= Depression Anxiety Stress Scales - Stress; DASS-21 A= Depression Anxiety Stress Scales - Anxiety; DASS-21 D= Depression Anxiety Stress Scales - Depression; SUS= System Usability Scale. Significant means ± standard deviation are in bold.

Table 2 shows descriptive statistics stratified by low and high levels of system usability, with a p-value for the difference. The chi-square test, Kruskal Wallis, and Student's t-test for the independent sample were used to compare means between sub-samples.

Table 2. Descriptive analysis of teachers' characteristics.

	Low System Usability	High System Usability	p value
Gender			
male	3 (11.1%)	8 (10.3%)	.901
female	24 (88.9%)	70 (89.7%)	

Age range

< 39 years	7 (25.9%)	21 (26.9%)	.645
40–49 years	8 (29.6%)	21 (26.9%)	
50–59 years	10 (37.0%)	27 (34.6%)	
60–69 years	2 (7.4%)	9 (11.5%)	
> 70 years	0	0	

Region

North	15 (55.6%)	27 (34.6%)	.138
Centre	5 (18.5%)	16 (20.5%)	
South	2 (7.4%)	14 (17.9%)	
Islands	5 (18.5%)	21 (26.9%)	

School grade

High school	18 (66.7%)	46 (59.0%)	.389
Junior high school	3 (11.1%)	12 (15.4%)	
Primary school	4 (14.8%)	13 (16.7%)	
University	2 (7.4%)	6 (7.7%)	
Kindergarten school	0	1 (1.3%)	

DASS-21

Stress	11.48 ± 5.89	7.34 ± 5.59	< .001
Anxiety	5.18 ± 4.73	3.26 ± 4.64	.075
Depression	8.00 ± 6.15	3.87 ± 4.64	<.001

Note: Mean ± standard deviation we used to describe continuous variables; proportions (numbers and percentages) were used to describe categorical variables.

Linear regression showed that there were no statistically significant differences between age and levels of anxiety ($p = 0.088$), stress ($p = 0.118$), and depression ($p = 0.328$). There were no statistically significant differences between grade school teaching and levels of anxiety ($p = 0.489$), stress ($p = 0.789$), and depression ($p = 0.810$). There were no statistically significant differences between gender and levels of anxiety ($p = 0.720$), stress ($p = 0.075$), and depression ($p = 0.215$). Stress was significantly correlated with anxiety and depressive symptoms ($p < 0.001$ for both tests).

Finally, 81.1% of teachers consider the DL system useful and would like to employ it in the future (47.2%). Still, they believed this system differed from traditional teaching methods (73.6%). Furthermore, the teachers highly accepted the DL (mean 62.83 ± 19.1). The usability of DL was negatively correlated with stress, anxiety, and depression ($p < 0.001$ for both tests).

DISCUSSION

The aim of the study was to investigate the usability of the system, the stress and the mood of teachers using distance learning (DL) in a sample of Italian teachers. In recent years, an increase in DL has been observed in all schools at all levels throughout the duration of distance learning. Ambusaidi and Al Abri found that 93% of participating teachers encountered challenges in implementing a distance learning [25]. In the face of pandemic-specific demands, some reported increased emotional exhaustion, a component of burnout syndrome related to the additional workload in terms of weekly hours, concern for students and concern for health [26,27]. While data on stress and depression among teachers has been extensive over the past two years, the evidence on

associations between systems use and mood is relatively small [28–30]. In the observed sample, we found low levels of stress and depression, but no anxiety. Levels of stress, anxiety and depression appear to be independent of age in our sample. This result is in contrast to other studies. Bianchi & Caso found significant age differences in emotional exhaustion and computer anxiety between age-related groups of teachers [26]. The authors found that older teachers showed higher computer anxiety and appeared less interested in distance learning platforms than middle and younger groups. Furthermore, we found no difference between genders or school classes in the level of stress, anxiety and depression. On the contrary, Truzoli, Pirola & Conte found that female teachers had a more favourable impression of the online teaching experience than their male colleagues [17].

The more interesting finding is that teacher stress was significantly correlated with anxiety and depressive symptoms, while usability of DL was negatively correlated with stress, anxiety and depression. To our knowledge, this is the first time that the correlation between the estimated usability of the DL system and teachers' mood has become apparent. In other words, the higher the stress level, the more anxiety and depressive symptoms. On the other hand, the higher the user-friendliness of distance learning is estimated, the lower the negative emotionality.

Although there was no lack of positive emotions, the teachers' emotional experience turned out to be predominantly negative: Fear, fatigue and uncertainty were shown to be the top three emotions experienced during the pandemic [31]. Having to cope immediately with a new school model (DL) with inadequate resources and skills added to the complexity of the emergency phase [32].

It is possible that the teachers' lack of experience in delivering DaD did not help to create particularly engaging and interactive lessons for "digital natives" Boredom, loneliness, and confusion were the three primary negative emotions felt by the students instead [33]. The social isolation that characterised this phase has played an equally significant role in influencing students' emotions [34]. Uncertainty about the future school organisation was the biggest source of stress for the teachers interviewed [35], followed by work-life balance [36,37] and managing the workload [38].

Despite these facts, we found that 81.1% of teachers found the DL system useful and showed a high level of acceptance of DL. According to the qualitative study conducted by Microsoft Italia, 70% of teachers report a significant improvement in their relationship with technology, which has led to substantial benefits in the practice of the profession. The use of digital tools has made teachers more motivated (17%), more focused (9%) and generally more satisfied with their work (9%). Generally, the Italian teachers surveyed perceive a positive climate within their school community.

At the same time, teachers in our sample felt that this system is different from traditional teaching methods (73.6%). The lack of appropriate tools and infrastructure - inadequate internet connections and lack of equipment in some parts of the country - remains the main obstacle to the full implementation of online teaching [39], followed by the more significant number of distractions students face at home compared to the traditional classroom [40].

Study limitations

The study has some limitations that need to be pointed out—first, the higher participation rate among women. Women are more likely to answer online interviews and are more represented in Italian schools than their peers. Second, the higher confidence in devices to answer. Technology enthusiasts may be more likely to complete an online form. In contrast, teachers with more significant difficulties or technology deniers with more negative attitudes towards system usability still need to answer the survey. The last limitation could be due to self-report instruments that may only partially capture the observed phenomenon. All these limitations could be improved by broader data collection and sample recruitment, combining online and face-to-face questionnaires.

CONCLUSION

Fatigue and stress are the first two negative emotions related to technology use shared by teachers and students. This confirms that DL was introduced in this form to address the emergency and cannot fully replace face-to-face teaching, which remains fundamental and necessary. The findings suggest that distance learning must be rethought to be permanently integrated into traditional teaching.

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Institutional Review Board Statement: The Declaration of Helsinki conducted the study for studies involving humans. Participation was voluntary, and subjects signed an informed consent explaining the purpose of the research and guaranteeing anonymity and privacy for sensitive data. The study followed the ethical research principles contained in the Declaration of Helsinki. The participation did not involve the manipulation of psychological variables nor an experimental treatment or condition that could cause any modification or harm to the participating subjects.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

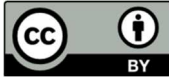
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