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Using Personal Learning Environments before, during and after the Pandemic: The Case of "e-Me"

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Abstract: The rapid developments in early 2020 with the emergence of COVID-19 have led humanity into unexpected situations with significant implications at all levels. In trying to cope with the urgent need for distance education, the Greek educational community has incorporated various platforms and digital tools previously unknown to most teachers and students. This study uses a mixed research method to capture (a) the frequency of use of a Personal Learning Environment called 'e-me' by the teachers before, during, and after the quarantine, and (b) the reasons why some teachers did not use this environment during these three periods. A total of 902 Greek teachers from primary and secondary education participated in this research. The results showed an almost universal non-use of 'e-me' before the pandemic and universal usage during the pandemic. Moreover, about 40% of these teachers used this personal learning environment after the pandemic. The main reason for not using this learning environment in the three periods is teachers' familiarity with the interface of another platform. Implications for educational policy and teacher development programs are discussed.

Keywords: digital platforms; personal learning platforms; PLE; e-me; distance education; COVID-19; teachers' experience

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1. Introduction

The effective integration of ICT in the educational process by teachers is one of the main objectives of any systematic effort to develop educational policy at the global level [1,2]. According to a report by the Eurydice Network [3], ICT provides a wealth of educational tools whose use opens new paths and perspectives in the educational process [4]. They can be adapted to the characteristics of each learner but also provide them with the proper skills to lead to the best possible educational outcomes. On the other hand, it is pointed out that more than technical knowledge is needed to achieve these aims. For instance, the constructive integration of ICT in education and the appropriate preparation of prospective teachers to use ICT in their classrooms is an essential aspect of their professional development [5].

The rapid changes in 2020 with the COVID-19 pandemic resulted in the shutdown of academic units of all educational levels [6–8]. Teachers and students were informed and trained to incorporate the characteristics of distance education into the teaching and learning process [8]. Small classes (groups) were formed so that teachers could support personalized learning, collaborative knowledge-building, and student-centred activities [9]. In addition, teachers were involved in a multidimensional effort to determine online learners' high degree of involvement through communication, constant feedback, and critical discourse [10].

Regarding the Greek educational community, the Ministry of Education announced a series of decisions and circulars which recommended using digital resources, and set as an initial goal the maintenance of contact with the educational process by students and teachers [11]. Furthermore, it announced a plan involving three pathways [12]:

- Synchronous teaching using Cisco's Webex videoconferencing platform
- Asynchronous distance learning introduced by 'e-me' and 'e-class' platforms
- Educational TV lessons by the national broadcast channel.

In this context, all educational community members at all levels used various technological tools previously unknown to most of them [8]. After several months, emergent distance education was present in every aspect of the daily educational process, and synchronous teaching using the Webex platform proved essential [13].

The first teachers' training introduced the principles and methods of distance education but took place one year after the first lockdown. Hence, distance education was implemented without an appropriate framework and partially maintained educational functioning. As such, that implementation highlighted several initiatives and creditable efforts, but also many limitations in the field of educational policy. A specific pedagogical framework and the inability to implement a versatile training program in the classroom use of ICT negatively impact the project's quality and effectiveness [14].

At the same time, e-learning platforms, Learning Management Systems (LMS) such as Moodle, and 'e-class' platforms, were promoted and enhanced. In addition, apart from such systems, school units had at their disposal another tool, the digital platform 'e-me', which was designed in the framework of the "Digital School" project (dschool.edu.gr) by the Directorate of Strategy and Digital Educational Material of CTI DIOPHANTUS (https://www.cti.gr/en/ accessed on 1 November 2023).

2. Personal Learning Environment

As mentioned above, schools in Greece had to choose either 'e-class', an LMS already available for over a decade, or 'e-me', a personal learning environment (PLE), of which functional version 2.0 was released in late 2019. According to the research of Nikiforos, Tzanavaris and Kermanidis [15], most teachers participated in distance education regardless of their previous training in ICT or experience. Moreover, teachers used the asynchronous form of teaching more than those who used the synchronous form. Furthermore, half the teachers said they would use distance teaching in the future. Regarding the frequency of teachers' use of official websites, portals, and repositories, they used interactive textbooks and various e-learning platforms (e-class, Edmodo, Moodle). Furthermore, according to Dimitriou [14], 70.76% of the respondent teachers answered that they had not used the 'e-class' before the pandemic, while only 29.24% answered positively. As for 'e-me', 93.80% answered negatively, and 6.20% answered positively.

Regarding the use of the two platforms in 2020–2021, Antonopoulos [16] presents that:

- according to the Greek School Network (GSN) statistics, for the school year 2020–2021, 'e-class' hosted 377,583 electronic courses, 1,066,407 students, and 155,932 teachers from 10,230 schools across the country (GSN, April 2021); and
- a total of 480,672 students and 119,052 teachers were registered on the 'e-me' digital platform for asynchronous education, and 150,130 "hives" had been created (Digital Education Platform e-me, April 2021).

The 'e-me' system puts the student at the centre of the educational process, aiming to highlight the importance of personalized learning through many digital tools via interaction with many different learning communities. It is a PLE consisting of tools, services, and communities by which the learner takes control of his/her learning path. It was first introduced in 2015 as an official educational platform for all students and teachers in Greece. "*Since then, e-me has evolved greatly and expanded with new functionality, being today a mature and innovative educational platform supporting modern pedagogy, with three editions/installations and more than 650,000 registered users (140,000 teachers and 530,000 students). To the best of our knowledge, e-me is one of the first, if not the first, open-source implementation of a PLE for school education, designed for nationwide use by all students and teachers*". [12] (p. 6620). It is a modern, social, and expandable PLE platform that provides a safe space for working and collaborating for students and teachers at all education levels [17]. The term PLE describes all these tools, communities, and services that form part of the learner's platform

to direct the learning process and set his/her own learning goals. It is a system that integrates multiple other subsystems [18]. It highlights ways learners can easily access various digital applications in a broader learning network [19]. Furthermore, by using PLEs, teachers can enhance the development of their students' autonomy in the learning process [20]. In addition, according to Väljataga and Laanpere [21–23], a well-designed PLE should address various educational issues more deeply and enhance the learning process by redefining learning plans. Furthermore, it must provide ways to control the technological infrastructure, acknowledge that teacher and student are confronted with the same system in an equal relationship, and highlight the shift from the robust traditional model to more learner-centred models. Finally, experimental data support that the PLE enhances participants' higher-order thinking skills and satisfaction [24].

PLEs emerged from the fact that LMS and Virtual Learning Systems failed to meet the learner's needs as well as they should have [17]. Furthermore, according to the international literature, there is an extensive debate regarding whether PLE is just another technological tool or stands out as a new approach to integrating technology into the teaching and learning process [25–27].

The 'e-me' is a PLE in two versions; the main version is available for the educational community. Therefore, users can access it through their Greek School Network account. There is also the 'e-me' for all versions for everyone interested. In any case, using the platform starts with creating a profile through which it is possible to search and add contacts. Afterwards, a user can create collaboration spaces (so-called 'hives'), assign tasks to the hive members, design and communicate through personal blogs, organize, and view students' work, and communicate between members through video calls and real-time messaging [12]. A user can also create interactive learning objects and provide links to the National Repository of Learning Objects, "Photodentro LOR", the e-books Repository, and many other tools. PLEs have become essential experiences during the pandemic, and studies worldwide aimed to analyze the new learning environments. In addition, an effort is made to develop the capacity of future teachers to be autonomous in carrying out tasks that require both theory and practice [28].

During the pandemic, and in the context of using digital classrooms in the teaching and learning process, the 'e-me' platform was another tool for teachers coping with the characteristics of a new and rapidly-evolving situation. "*Regardless of their limited prior experience, teachers became content creators and developed over 230,000 interactive learning resources using the H5P-based 'e-me content' application*" [12] (p. 6626).

Notably, 'e-me' is now becoming multilingual and is embarking on its European "e-me4all.eu" journey, with schools in various European countries piloting it to support collaborative educational activities. More specifically, its adaptation in English, Portuguese and Polish was carried out by CTI DIOPHANTUS in the European project Partnerships for Science Education. In contrast, its adaptation in German, Bulgarian, Lithuanian, and Latvian is being implemented in the European project iLearning-eCreativity-eDiversity (Erasmus+).

Research worldwide has shown that the quality of the platform used in the educational process positively affects students' performance in distance education. More specifically, the quality of learning modules, systems, and services, as well as compatibility with the needs and expectations of learners, can contribute favourably to increasing user satisfaction and effective use of the e-learning system [29], as well as acceptance of the opportunities created by the e-learning process [30]. In addition, we note that more studies agree that only technical training or technical skills are insufficient produce effective e-learning outcomes [31,32]. Instructional and communicative skills should also be focused on [33]. Finally, even though there were voices regarding the importance of distance learning in the case of a pandemic, the extent still needs to be foreseen. Relevant research on the use of these platforms and their features in the post-pandemic period gives us time to design a "digital pandemic" pedagogy [15]

According to the literature, teachers usually mention that the reasons preventing them from integrating technology in class (also called barriers) are both external (or first-order)

and internal (or second-order) barriers [34]. Some examples of external factors are limited resources and equipment, lack of time, and lack of technical support. Internal factors may include teachers' negative attitudes and beliefs towards technology and lack of confidence and self-efficacy [35]. Regarding integrating the PLEs in class, these barriers must be considered during this pandemic emergency since teachers and students were adjusting to a different mode of teaching and learning [36].

To the best of the authors' knowledge, no earlier attempt has been reported worldwide about the frequency of use of PLE by the Greek educational community in these three periods. In this context, as a part of extensive research, the present study captures teachers' 'e-me' platform use before, during, and after the pandemic. Thus, this work will provide more insights regarding the usage of 'e-me' and the associated challenges during this pandemic. In addition, the findings of this study have implications not only for Greece but also for other countries that implemented distance education during this pandemic and even beyond it.

3. Research Scope and Description

3.1. Aims of the Research

Based on the problem developed previously, we set the following research aims:

(i) To measure the frequency of use of the 'e-me' platform by teachers in the three periods: (a) before the pandemic (face-to-face teaching), (b) during the pandemic (distance learning), and (c) after the pandemic (face-to-face teaching).

(ii) To indicate why some teachers did not use the 'e-me' platform during the three periods.

3.2. Research Context

This mixed research with quantitative and qualitative data [37] was conducted in May and June 2021, at the end of the school year 2021–2022. As a reminder, the face-to-face teaching process was gradually re-established in April of the same year. Given the centrality of the emergent need for teachers to use technology in teaching, the authors came up with a research design that attempted to capture the big picture of teachers' patterns of acceptance of technology in PLEs. The conception of this study occurred during the design of the Erasmus+ project KEEP: key engaging educational practices used by secondary school teachers to stay connected with their students following the COVID-19 pandemic, aiming to reveal, examine, share, and, most importantly, discuss practices used by teachers to keep students involved in the learning process in partnership in four countries (Belgium, France, Greece and Poland), duration March 2021–May 2023. The KEEP project's general objective is to help reduce school underachievement and low involvement in the learning process among European students caused by their inability to attend schools physically.

Stage one of this study, reported here, was designed to be large-scale and is characterized as a 'first and rapid response' research [38]. Established quantitative and qualitative methods and ethical guidelines [39] were used to increase teachers' participation in the research. The study explored educators' experiences and perceptions of using the 'e-me' platform during three different periods.

A convenience sample of primary and secondary educators was asked to complete an online questionnaire sent via email to schools. The questionnaire consisted of two sections. The first section of the questionnaire collected demographic information (e.g., gender, age, type of school they teach, years of experience, postgraduate studies, and ICT training). The second asked participants whether they have used the 'e-me' platform for any reason (Question 1). In the case of a positive response, we asked teachers to indicate using a 7-point scale (not at all, once a month, twice a month, three times a month, 1–2 times a week, 3–4 times a week, every day) whether they had used it in the educational process before (Question 2), during (Question 3), and after (Question 4) the pandemic. For the teachers who indicated they had not used it, we asked an open-ended question (Question 5) to explain their reasons. On average, it took participants five minutes to complete.

4. Data Analysis Method

Regarding the first aim, we first presented the distribution of the subjects' responses and calculated specific descriptive statistics [40]. The cluster analysis was based on three variables corresponding to the three questions on the platform's educational use in the classroom (2, 3, and 4). Specifically, we applied hierarchical cluster analysis in which we utilized as a measure of similarity among the cases the Euclidean distance and, as a method of separation of the groups, the Ward method, intending to create a distribution as homogeneous as possible within groups and, at the same time, a heterogeneous one between them [41]. All the earlier analyses were performed in the SPSS environment [40].

Regarding the second aim, we conducted a thematic analysis [37] of teachers' responses to question 5. We adopted the thematic analysis method in the NVivo qualitative analysis software program as the most appropriate method to search for the main categories in our qualitative research data. More specifically, all teachers' responses who stated that they had not used 'e-me' during the three periods have been transcribed using the NVivo environment and used as the primary material for the coding. The analysis resulted in a specific scheme of three main categories (parent nodes—PN) and sixteen subcategories (children's nodes—CN). Below, in the results section, the coding scheme is described in more detail.

Participants Characteristics

A total of 902 teachers participated in this survey. Table 1 shows the characteristics of participants separately who had not used e-me (N = 362), and (b) who had used it (N = 540).

Table 1. Demographic characteristics of participating teachers (N = 902).

	Have You Used e-Me for Any Reason (Experience with the Platform)	
	No (N = 362)	**Yes (N = 540)**
Gender:		
Male	25.1%	22.4%
Female	74.9%	77.2%
Age (years):		
Up to 35	3.9%	5.0%
36 to 40	9.7%	9.6%
41 to 45	10.5%	14.8%
46 to 50	18.0%	21.9%
51 to 55	37.0%	33.5%
At least 56	21.0%	15.2%
Type of school:		
Preschool	18.5%	13.1%
Primary	20.2%	41.1%
Secondary	32.0%	26.9%
High	18.5%	14.3%
Vocational high	10.8%	4.6%
Educational experience (years):		
Up to 5	9.9%	5.2%
6 to 10	3.3%	4.3%
11 to 15	12.7%	15.6%
16 to 20	17.7%	26.1%
21 to 25	21.8%	20.4%
At least 26	34.5%	28.5%
Postgraduate studies		
No	53.3%	48.9%
Yes	46.7%	51.1%
ICT training:		
No	30.7%	17.6%
A level	11.3%	8.5%
B1 level	23.2%	22.6%
B2 level	34.8%	51.3%

5. Results

Figure 1 shows the distribution of responses from teachers (N = 540) who showed they had used the 'e-me' platform for any reason in their teaching in the three periods. More specifically, we observe an almost universal non-use of the platform before the pandemic (blue colour) and an almost universal use (75% at least once a month and 50% weekly use) during the pandemic period (red colour). Although this pattern does not remain after the pandemic (green), 23% said they still use it weekly.

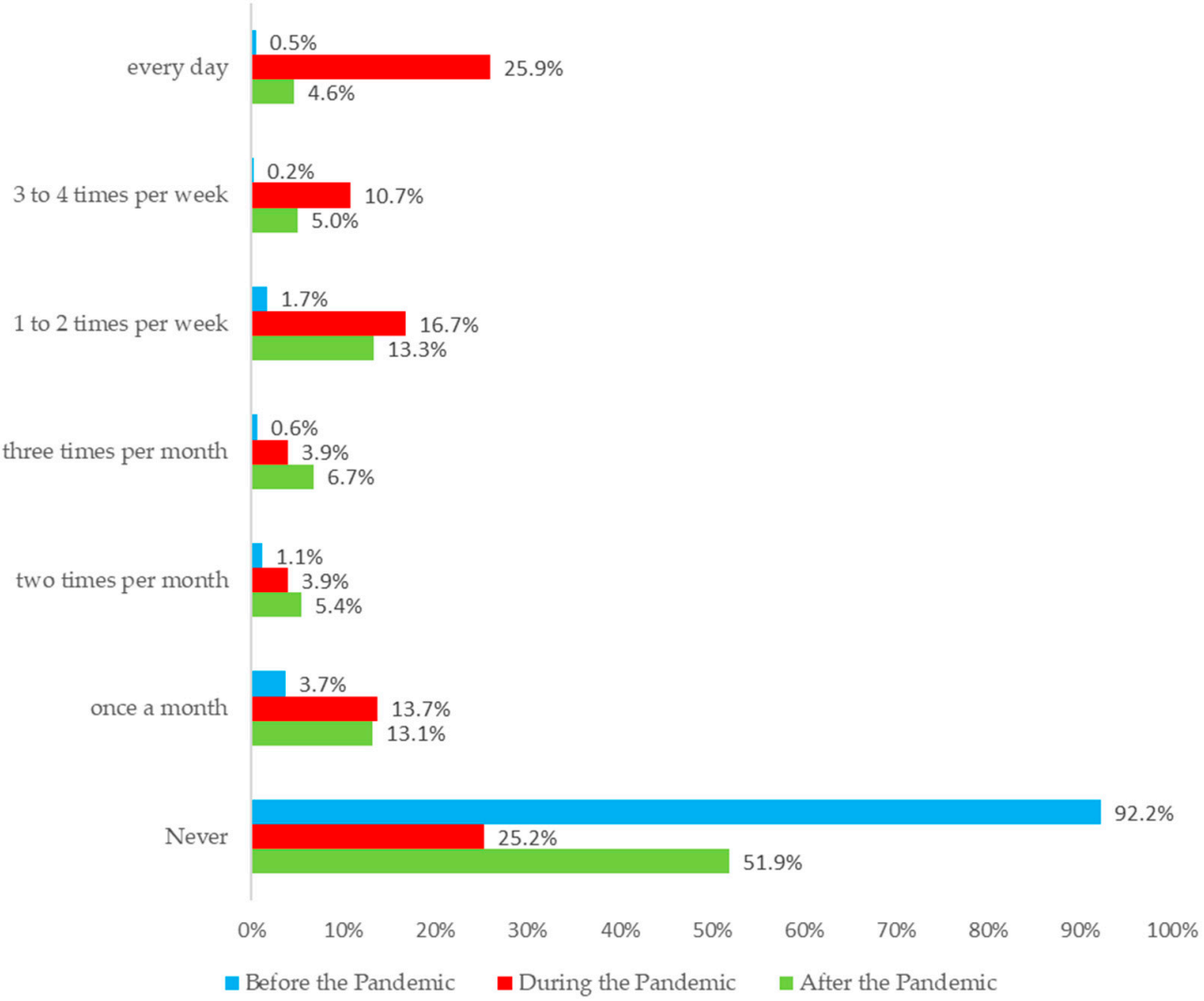

Figure 1. Teachers' use of e-me in the three periods.

In addition, cluster analysis revealed three clusters (groups) of teachers. In Table 2, we separately present for each cluster the descriptive statistics (mean and the three quartiles) of the variables used in the cluster analysis [40]. The first quartile is the data set's value, where 25% of the data is below this. The second quartile is the median of a data set; below this is 50% of the data, while the third is the data value set; below this is 75% of the data. We based descriptions of the groups on these three quartiles. In this way, for each cluster, we indicate the frequency of use of 'e-me' in the three periods as it is determined that 50% of the teachers' responses (frequency of use of 'e-me') are mainly located between the first quartile and third quartile.

Therefore, the first group constitutes 32.8% of teachers who responded from never to once a month—a similar frequency use of 'e-me' before, during, and after the pandemic. The second group constitutes 42.9% of teachers who used 'e-me' in the three periods: from

never to once a month, from weekly to daily, and from once a month to weekly. Finally, the third group is the 24.3% of teachers who reported 'e-me' platform usage of never to once a month, from once a month to weekly, and from never to once a month in these three periods, respectively.

Table 2. Descriptive statistics of the variables used in the group's cluster analysis.

		Variables That Were Used in the Cluster Analysis		
		Before the Pandemic *	**During the Pandemic ***	**After the Pandemic (Face-to-Face) ***
Group 1: 177 (32.8%)	Mean	0.1	0.4	0.7
	1st quartile	0.0	0.0	0.0
	Median	0.0	0.0	0.0
	3rd quartile	0.0	0.0	1.0
		Never—Once a month	Never—Once a month	Never—Once a month
Group 2: 232 (42.9%)	Mean	0.3	5.4	3.0
	1st quartile	0.0	5.0	1.0
	Median	0.0	6.0	4.0
	3rd quartile	0.0	6.0	4.0
		Never—Once a month	Weekly—Daily	Once a month—Weekly
Group 3: 131 (24.3%)	Mean	0.0	2.6	0.0
	1st quartile	0.0	1.0	0.0
	Median	0.0	2.0	0.0
	3rd quartile	0.0	4.0	0.0
		Never—Once a month	Once a month—Weekly	Never—Once a month

Notes: * 0. "Never (N)", 1. "once a month (M)", 2. "2 times per M", 3. "3 times per M", 4. "1–2 times per week (W)", 5. "3–4 per W", 6. "daily (D)."

Furthermore, teachers' statements were coded in the qualitative data analysis program NVivo to study the reasons for not using e-me before, during, and after the pandemic (Question 5). Specifically, all their responses were transferred to NVivo so to develop a first categorization scheme. Then, at a second level, our coding showed us that some of these categories of analysis were parts of a larger one. This process enabled us to reconstruct the original categories and subcategories and to add new ones, thus approaching more complex and meaningful concepts. According to the NVivo qualitative analysis program we used to code our material, these basic analysis categories are called 'parent nodes' (PN), and their subcategories are called 'child nodes'.

In the end, three categories (parent nodes—PN) and sixteen subcategories (children's nodes—CN) emerged, as shown in Figure 2. The category "PN2_ no platform use" consists of four subcategories: "CN11_not needed", "CN12_school was not closed", "CN13_refusal to use any platform due to general ignorance of the use of new technologies", and "CN14_refusal to use any platform due to other ways of communicating with parents and students". All teachers' responses who stated they did not have to use digital platforms before, during, and after the pandemic were coded into the following subcategories: CN11, CN12, CN13, and CN14.

In addition, the coding reports in NVivo and the overall coding diagrams of the data were used. More specifically, as illustrated in Figure 3 below, the most frequently-occurring reasons for not using the 'e-me' platform during these three periods are related to the category (PN1), "Preference for another platform". In particular, the subcategory "CN3_due to preference familiarity with another platform" concerns the most significant percentage of coded responses given by the respondent teachers (30.9%). This is followed by "CN9_ due to ignorance/lack of familiarity" (21.9%) and "CN10_due to the non-user-friendly interface of e-me" (21.9%). In addition, a large group of teachers seems not to use e-me because their school decided to use another platform (e-class), "CN8_ due to the choice of another platform (e-class) by the school" (7.39%). Smaller but still notable groups of teachers claimed they did not use 'e-me' either because it is more suitable only for primary education ("CN2_due to the suitability of

e-me only for primary education": 3.9%), or they do not accept the use of any platform in the educational process ("CN13_ refusal to use any platform due to general ignorance of the use of new technologies": 2. 2% and "CN14_ refusal to use any platform due to other ways of communicating with parents and students": 3.1%). Finally, a small group of teachers seems to have changed their opinion after attending a relevant training program ("CN15_ T4E teachers training program": 1.1% and "CN16_other training program": 0.6%).

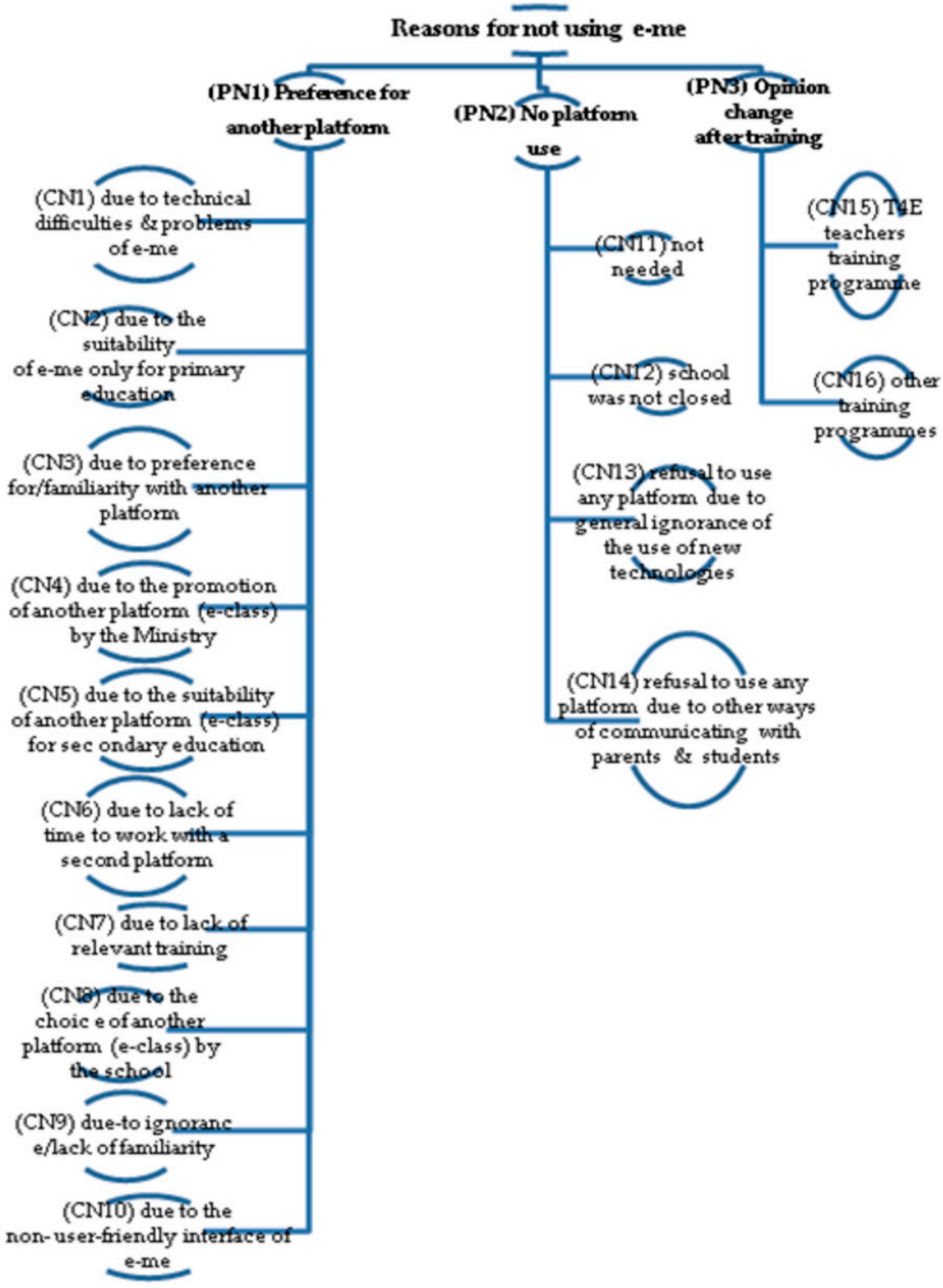

Figure 2. The categories and subcategories of analysis.

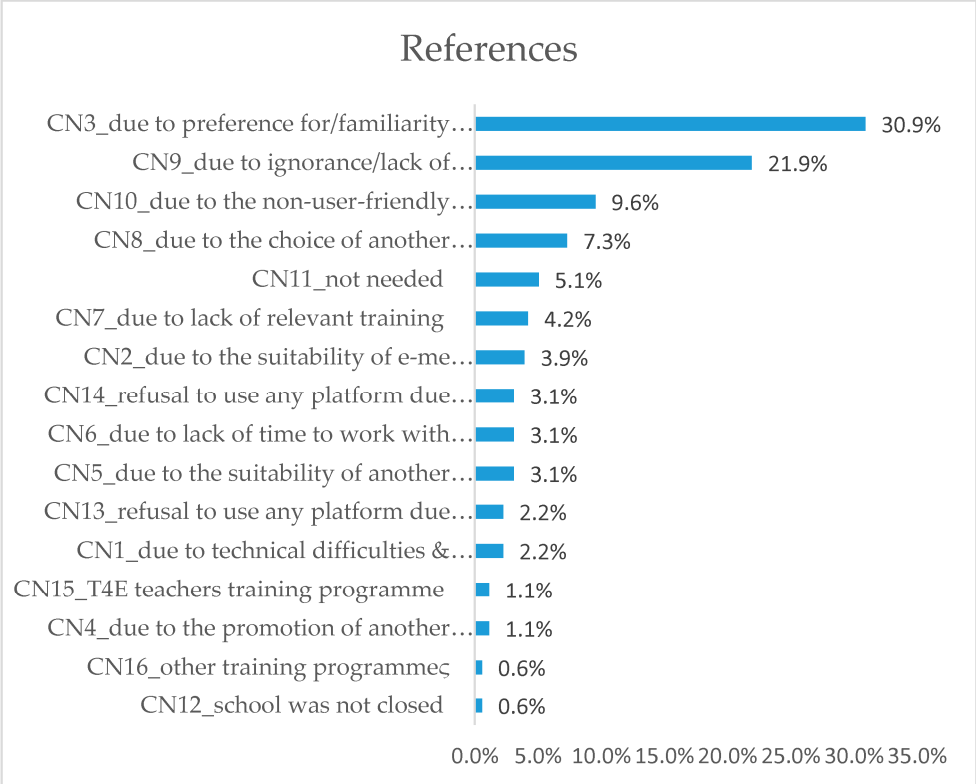

Figure 3. The coding distribution.

6. Discussion

The present research examined teachers' use of PLEs, and specifically the 'e-me' platform, before, during, and after the pandemic. Most of the research points out the characteristics a teacher should have to make the best use of them [9], talking about technological skills, student-centred learning environments, and collaborative communities [15,29]. Furthermore, research showed that regardless of teachers' previous training in ICT or their knowledge about distance education, the majority participated in it, even though it was optional. More teachers used the asynchronous form of teaching than those who used the synchronous form [16]. Schools in Greece had to choose either 'e-class', an LMS already available for over a decade, or 'e-me'.

Our research draws information on the non-use of the 'e-me' platform before the pandemic [14]. By contrast, its widespread use during the pandemic was notable. This "universal" use of 'e-me' during the pandemic seems to be confirmed, since many teachers and students have registered on the 'e-me' digital platform for asynchronous education [16]. Furthermore, it is noteworthy that although this pattern does not remain after the pandemic, one out of five teachers stated that they use it weekly. On balance, cluster analysis revealed three groups of teachers. The first group consisted of teachers with the least frequent use of 'e-me' before, during, and after the pandemic. The second group consists of teachers with the least frequent use of 'e-me' during and after the pandemic, from once a month to daily. Finally, the third group is characterized by the least frequent use of 'e-me' before the pandemic, almost weekly use during it, to seldom using it after the pandemic.

Nevertheless, teachers used this platform during the pandemic quite often. Moreover, it is worth mentioning that four out of ten teachers appeared to use the platform after the pandemic (second group). Consequently, it is shown that distance education allowed teachers to get acquainted and familiar with new tools useful in their teaching.

In addition, the investigation of the open-ended question about why teachers do not use the 'e-me' platform revealed that most teachers preferred using another platform (e.g., e-class) due to its familiarity and usability, or their ignorance of this platform. Other studies confirm

this finding [8,13]. Similarly, teachers mention these reasons for their refusal to use LMS [42]. Moreover, the coding of their statements showed us that several teachers considered 'e-me' challenging to use or only suitable for primary education. Similarly, in other studies about different technology systems, perceived ease of use is a significant factor that explains the teachers' intention to use this system [43]. Whether technology is perceived as complex to learn and use influences how likely it is to be perceived as time-consuming and tedious to invest in by a user [44].

Finally, smaller groups of teachers stated they were unwilling to use any platform in their educational process or that while they were hostile towards using 'e-me', they changed their minds after receiving training. This lack of training about innovative technologies and their educational utilization has been discussed as a primary concern in various studies [8,13,45].

7. Implications and Limitations

The previous findings may be of particular interest to conduct a study to identify precisely the factors that explain teachers' intention to use or not to use the 'e-me' platform based on its usability and, consequently, to come up with suggestions for further improvement of its features. Furthermore, with the appropriate teacher development programs, it may lead to more extended use of PLE platforms such as 'e-me'. These training programs could offer teachers adequate evidence about the benefits of instructional technology on student learning so they would be motivated to use 'e-me' more widely.

A limitation is that the study uses self-reporting, running the risk of socially desired responses and measurement bias [46]. In addition, this study was conducted immediately after the return to the face-to-face training process, with any effect for measuring the frequency of platforms used for the post-pandemic period. Thus, there is further interest is the repetition of the survey today, one year after the return to the classroom. Moreover, the correlation of the respondents' demographic data to the above-mentioned different choices in platform usage is a stimulating idea for further processing and determination of new characteristics.

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

Data Availability Statement: The data are not publicly available as this is ongoing research.

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Conflicts of Interest: The authors declare no conflict of interest.

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