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MOOCs in teachers' professional development: examining teacher readiness

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Abstract

MOOCs play an important role in teachers' professional development. However, little is known about teacher readiness to participate in a MOOC and research data is very limited, especially in the Greek context. Thus, the purpose of the present study is the investigation of readiness of primary and secondary public school teachers to participate in MOOCs as a way of professional development. A total of 216 Greek in-service teachers participated in the quantitative study and attitudes towards readiness dimensions were examined. The results revealed that the teachers in general show quite high level of readiness to use MOOCs in the context of their professional development, while some of their individual characteristics seem to affect certain dimensions. In particular, teachers show low awareness of MOOCs level, recognize the benefits of MOOC learning as well as MOOC usefulness in their professional development. Still, further investigation is needed.

Key words

Massive Open Online Courses, MOOC, teacher professional development, teacher readiness, MOOC perceived benefits and usefulness.

Περίληψη

Τα MOOCs διαδραματίζουν σημαντικό ρόλο στην επαγγελματική ανάπτυξη των εκπαιδευτικών. Παρόλα αυτά, λίγα είναι γνωστά σχετικά με την ετοιμότητα των εκπαιδευτικών να συμμετάσχουν σε ένα MOOC και τα ερευνητικά δεδομένα είναι περιορισμένα, ιδιαίτερα στο ελληνικό πλαίσιο. Συνεπώς, σκοπός της παρούσας έρευνας είναι η διερεύνηση της ετοιμότητας εκπαιδευτικών δημοσίων σχολείων πρωτοβάθμιας και δευτεροβάθμιας εκπαίδευσης για χρήση των MOOCs ως μέσο επαγγελματικής ανάπτυξης. Συμμετείχαν συνολικά 216 εν ενεργεία εκπαιδευτικοί στην ποσοτική έρευνα και διερευνήθηκαν οι στάσεις σχετικά με διαστάσεις της ετοιμότητας. Τα αποτελέσματα αποκάλυψαν ότι οι εκπαιδευτικοί γενικά παρουσιάζουν αρκετά υψηλό επίπεδο ετοιμότητας να χρησιμοποιήσουν τα MOOCs στο πλαίσιο της επαγγελματικής τους ανάπτυξης, ενώ κάποια από τα ατομικά τους χαρακτηριστικά φαίνεται ότι επηρεάζουν ορισμένες διαστάσεις. Συγκεκριμένα, οι εκπαιδευτικοί δείχνουν χαμηλό επίπεδο επίγνωσης των MOOCs, αναγνωρίζουν τα οφέλη της μάθησης στα MOOCs, καθώς και την χρησιμότητα των MOOCs στην επαγγελματική τους ανάπτυξη. Ωστόσο, χρειάζεται περαιτέρω διερεύνηση.

Λέξεις κλειδιά

Μαζικά Ανοιχτά Διαδικτυακά Μαθήματα, ΜΑΔΜ, επαγγελματική ανάπτυξη εκπαιδευτικών, ετοιμότητα εκπαιδευτικών, αντιλαμβανόμενα οφέλη και χρησιμότητα των ΜΑΔΜ.

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1. Theoretical background

In recent years, online learning forms have been a popular way of learning. Among these forms are MOOCs as well (Hill, 2012). The popularity of the MOOCs increased in 2012, and they became well-known as a fast-growing learning movement. That year was described as the "the year of the MOOCs" (Pappano, 2012).

1.1. Massive Open Online Courses

However, what is a MOOC? First of all, it is an acronym of the word Massive Open Online Courses (MOOC). They are courses that involve a large population of learners and are open to everyone without limitations and fees. Also, they are offered exclusively online through a platform that facilitates the interaction among the individuals and they are organized courses with specific duration, learning objectives and educational material (European Commission, 2014; Christensen et al., 2013; Siemens, 2013).

Their history is related to both the distance-education evolution (Daniel, 2014) and the open education (Yuan & Powel, 2013). Also, two basic forms of MOOCs have emerged based on different pedagogical approaches: cMOOCs (Connectivism) and xMOOCs (Behaviorism), which have been further developed (Bozkurt et al., 2017; Zawacki-Richter et al., 2018). Moreover, research revealed the trend where the two forms are "merged" into a hybrid model (Anders, 2015). At this point, it is important to mention that even though there are different MOOC categorizations, the general term "MOOC" has globally prevailed instead of the term "xMOOC" (Kesim & Altinpulluk, 2015). The same use of the general term has been selected for the present article as well.

In addition, a variety of MOOC providers has been developed worldwide. Using the English language, the Americans Coursera, edX and Udacity, and the European FutureLearn are considered among the most popular ones, while the Chinese provider XuetangX has also impressive growth in terms of user registrations (Shah, 2018; Zawacki-Richter et al., 2018). In general however, MOOCs on the one hand are a phenomenon that has brought innovation and changes in the field of education, but on the other hand, there are definitely certain challenges, such as pedagogical, that need to be addressed (Bozkurt et al., 2017; Zawacki-Richter et al., 2018).

Another important issue in the field of MOOCs pertains to the users and the process of their participation, for which a lot of research has been carried out (Bozkurt et al., 2017). Among these efforts is Clow's metaphor of the 'funnel of participation'

according to which users' participation takes place into phases: awareness of MOOCs, registration, activity and progress (Clow, 2013).

In particular, user research has mainly focused on their demographics and enrolling motivation, on their engagement and their behaviors, and finally on completion rates and dropout reasons (Hew, 2016). Through these results, remarkable participation of workers as well as teachers has been observed (Castaño-Muñoz et al., 2017; Ho et al., 2015; Mathesis, 2018). At the same time, professional development is noted as one of the main enrolling motivations (Christensen et al., 2013; Kizilcec & Schneider, 2015; Liyanagunawardena, 2015; Milligan & Littlejohn, 2017).

1.2. Professional development

Teachers' professional development is defined as the acquisition of knowledge and skills through various forms of lifelong learning, for the improvement of both educators and education (Day, 2003). It is considered particularly important for the improvement of education, with an emphasis on the effectiveness of the procedure (Hobbs, 2017; Darling-Hammond et al., 2017). According to researches, there are numerous ways for a teacher to develop professionally (Hobbs, 2017). At the same time, the online forms for professional development are blossoming, making teachers' online professional development a promising sector (Egloffstein & Ifenthaler, 2017; Fishman et al., 2013; Reeves & Pedulla, 2011).

1.3. MOOCs and professional development

In recent years, efforts have been made so as MOOCs to be connected to corporate professional development (Shah, 2017). Thus, MOOCs are used in both private sector (corporate MOOC) (Bersin, 2014) and public sector (Sanchez-Gordon et al., 2015). There are significant benefits for the professional development of employees, especially of teachers, and various courses are carried out in this direction (Ji & Cao, 2016). However, there are certain prerequisites that have to be taken into consideration, including the need for participation readiness (Bali et al., 2015; Kpolovie & Iderima, 2016).

1.4. MOOC readiness

Readiness for MOOCs concerns the necessary skills and attitudes in order for someone to succeed in his learning through MOOCs (Kpolovie & Iderima, 2016). The examination of MOOC readiness is of great importance for the effectiveness of MOOC

learning (Gameel & Wilkins, 2019; Kpolovie & Iderima, 2016; Vasilevska et al., 2017). MOOC readiness is a multidimensional phenomenon that involves a variety of attitudes and skills (Rohayani et al., 2015), and for this reason measuring it is considered difficult (Farid, 2014). Among the commonly used dimensions during the evaluation of this phenomenon are technological knowledge and skills, learning organization skills, and learning motivation (Vasilevska et al., 2017).

Regarding the research of teachers' MOOC readiness, it appears to be quite limited (Fesol & Salam, 2016), while no relevant research was found in the Greek context. Meanwhile, most of the global researches about teachers mainly focus on their teaching role rather than themselves as learners (Hung, 2016). However, existing research data show moderate levels of awareness for MOOCs (Castaño-Muñoz et al., 2018; Radford et al., 2014; Roshchina et al., 2018). At the same time, MOOC readiness levels seem to be encouraging. Both advantages and disadvantages of MOOCs are acknowledged, and there appears to be a need for improvement of technological skills and of MOOCs awareness level (Castaño-Muñoz et al., 2018; Malita et al., 2018).

1.5. Greek context

In Greece, the form of opencourses has been mainly used by Greek universities (Kafantaris, 2015). Nevertheless, both the exploitation of MOOCs and the research in this field have been particularly limited (Papadakis & Kalogiannakis, 2014), as well as organized efforts for developing and implementation of MOOCs (Kappas & Tsolis, 2018).

However, in recent years an increasing change of the field has appeared in Greece with the creation of Greek MOOC providers such as Mathesis, Coursity and meaeX[4]. In the meantime, research findings show remarkable levels of participation of Greeks in domestic and foreign MOOC providers (Harris, 2016; Mathesis, 2018). Furthermore, teachers' attitudes seem to be positive (Koukis & Jimoyiannis, 2018; Koutsodimou & Jimoyiannis, 2015), while at student level the attitudes vary, with low levels of MOOC awareness (Giasiranis, Kostas, & Sofos, 2017). Finally, regarding Greek teachers'

[4] Mathesis (mathesis.cup.gr): a nonprofit department of Crete University Press founded in 2015. It offers courses for free in collaboration with Greek universities and a certification of attendance is available for a small fee.
Coursity (coursity.gr): a for-profit platform founded in 2017 in Ioannina. It offers courses for free in collaboration with Greek universities and a certification of attendance is available for a small fee.
meaeX (https://mooc.eap.gr/): a MOOC provider created by Hellenic Open University. It offers courses for free, however it is not available a certification of attendance.

professional development, it can be noted that there are several difficulties. There is a need for recognition of the importance and the necessity of professional development, and teachers tend to acknowledge the advantages of online learning (Maletskos & Lypitka, 2016, Mastrodimitris, Valkanos & Kioulanis, 2014).

1.6. Research gaps

Following the above analysis, certain research gaps have been emerged:

- There is limited research data for MOOCs in the Greek context (Kappas & Tsolis, 2018; Papadakis & Kalogiannakis, 2014), as well as on teacher readiness.
- Globally, investigation of employees as MOOC learners is limited (Milligan & Littlejohn, 2017).
- Investigation of teachers' online learning readiness as learners themselves is limited, even though necessary (Hung, 2016; Reeves & Li, 2012).

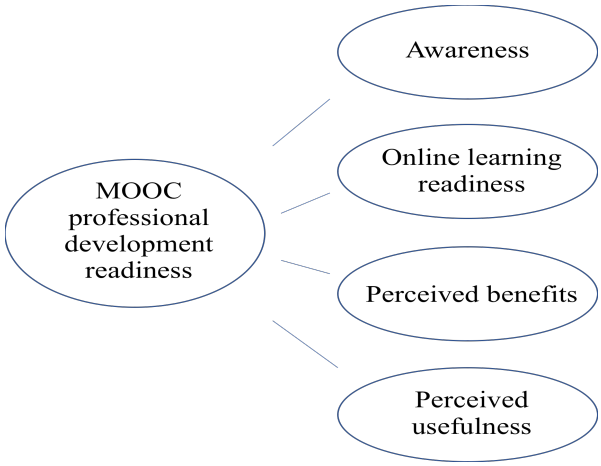
2. Methodology

2.1. Purpose, research questions

The purpose of the present study is the investigation of readiness of primary and secondary public school teachers to participate in MOOCs as a way of professional development.

The research rationale behind this study is:

Figure 1: Research rationale



Thus, the following research questions have been raised:

1. What is the level of awareness of MOOCs and MOOC providers among teachers?
2. Is there simultaneously awareness of the MOOC concept and non-awareness of MOOC providers, and vice versa?
3. What is the level of online learning readiness?
4. Is there a variation in levels of online learning readiness and readiness for learning in MOOCs, among those who are aware of MOOCs and those who are not at all?
5. What are the attitudes towards the benefits of MOOCs?
6. What are the attitudes towards the usefulness of MOOCs in teachers' professional development?
7. How do the level of online learning readiness and the attitudes towards the benefits and usefulness of MOOCs differ depending on the characteristics of the participants?
8. Do the general attitudes of teachers' MOOC learning readiness affect their attitudes on online learning readiness, perceived benefits and perceived usefulness?

2.2. Population, sampling, participants

Teachers represent a significant percentage of people enrolled in MOOCs (Ho et al., 2015; Mathesis, 2018). But especially for Greek teachers, the research data are very limited.

Data collection took place between March 1th and 18th 2018. An online version of the questionnaire using "google forms" was distributed through emails to primary and secondary schools as well as to teacher groups on facebook. It is therefore a random sample.

A total of 216 teachers of various specialties from public primary and secondary schools (general education) participated in the survey. Specifically, the sample consists mainly of women (69.4%) and most of the participants are over 35 years old (84.2%). The predominant educational specialties are pedagogical (38%), followed by science specialties (25.9%). Moreover, most of the teachers hold a postgraduate degree (49.5%) and have over 11 years of service in education.

Detailed data about demographics can be found in the table below (Table 1):

Table 1: Demographics

Profile	**Data**		**Percentage (%)**
Demographics	Gender	Men	30,6
		Women	69,4
	Age	Up to 35 years old	15,7
		36-49 years old	38,4
		Over 50 years old	45,8
	Level of education	Paidagogiki Academia	6,5
		Bachelor	38,9
		Didaskaleio	0,5
		Masters	49,5
		PhD	4,6
	Specialty	Pedagogical	38
		Science specialties	25,9
		Greek and foreign languages	21,3
		Other specialties	14,8
	Teaching experience	Less than a year	1,4
		1-5 years	10,6
		6-10 years	7,9
		11-20 years	39,4
		Over 21 years	40,7

2.3. Survey instrument

The quantitative data collection method was used to conduct this research. Therefore, suitable research tools were sought and, due to the fact that the Greek research of the MOOC field is very limited, scales of the international literature were used (Bhattacherjee, 2001; Davis, 1989; Fadzil et al., 2016; Fesol et al., 2016; Hung et al., 2010; Kyalo & Hopkins, 2013; Malita, 2018; Sawant, 2016; Tank & Chaw, 2013; Ulrich & Nedelcu, 2015). At the same time, the necessary adjustments of the scales

were made to the needs of the present study as well as to the Greek framework using the back translation process and by having some teachers test the questionnaire.

In particular, the final questionnaire consists of 7 units including closed questions, as summarized in Table 2.

Table 2: Survey instrument units

1. Demographics (5 items)	Gender, age, level of education, specialty, teaching experience
2. Access and use of technology (4 items)	Device mainly used for internet access, internet access via stable home connection, frequency of internet use, English language knowledge level according to Common European Framework (Council of Europe, 2001), prior online learning experience
3. Awareness of MOOCs and MOOC providers (2 items)	MOOC awareness level, MOOC providers awareness level
4. Online Learning Readiness Scale (OLRS) (Hung et al., 2010) (18 items)	It is divided into five parts using 5-point Likert scale measurement (1 totally disagree to 5 totally agree): i. Computer and internet self-efficacy (3 items) ii. Self-directed learning (5 items) iii. Learner control (in an online context) (3 items) iv. Motivation for learning (4 items) v. Online communication self-efficacy (3 items)
5. MOOC learning readiness (control scale) (6 items)	Based on previous studies
6. Perceived MOOC benefits (9 items)	Scale based on previous studies about possible MOOC advantages for learning and professional development
7. Perceive MOOC usefulness 8 items)	Scale based on Technology Acceptance Model (TAM), which is about teacher attitudes to possible MOOC usefulness in their professional development

3. Data analysis

3.1. Process of data analysis

The analysis of the data was conducted with IBM SPSS Statistical Data Analysis Statistics Package 23.

It is also necessary to point out that it was expected that teachers with no MOOC awareness would participate in the survey, so it was considered necessary to separate the questionnaire based on the answers to the MOOC awareness question. Therefore, those who are aware of the MOOCs have answered the whole questionnaire, while those who are not aware of the MOOCs have only answered the questions about online learning readiness and MOOC learning readiness. Thus, two distinctive samples emerged, Sample A (n = 149) and Sample B (n = 69), respectively.

3.2. Instrument reliability

The total and partial reliability of the research instrument was calculated for both samples using the Cronbach Alpha coefficient. Both values were found to be satisfactory, as shown in the following table (Table 3):

Table 3: Reliability

Total Cronbach: a=0,912 (n=147, excluded n=69)							
MOOC awareness: wasn't calculated				**MOOC providers**: 0,707			
		Total Sample		**Sample A**		**Sample B**	
OLRS	CIS	0,724	0,875	0,748	0,862	0,700	0,895
	SDL	0,771		0,766		0,785	
	LC	0,582		0,568		0,609	
	MFL	0,776		0,772		0,785	
	OCS	0,743		0,705		0,785	
MOOC learning readiness		0,816		0,685		0,874	
PB		0,766		0,766		-	
PU		0,854		0,854		-	

3.3. Descriptive statistics-Correlations

Descriptive statistics were used for the analysis of the data. Mean values and standard deviations were calculated and potential correlations were explored between the variables using parametric tests ($p > 0.05$), such as t-tests and one way ANOVA.

Regarding the second section of the questionnaire on access and use of technology, descriptive statistics were used (Table 4). It was found that teachers tend to use mainly a laptop to access Internet (53.7%), they have a stable home internet connection (97.7%)

and use it every day (97.2%). Finally, half of the participants are capable users of the English language, in other words they have a high level of communication skills in written and spoken language and most of them have previously participated in an entirely online course.

Table 4: Statistics on access and use of technology (n=216)

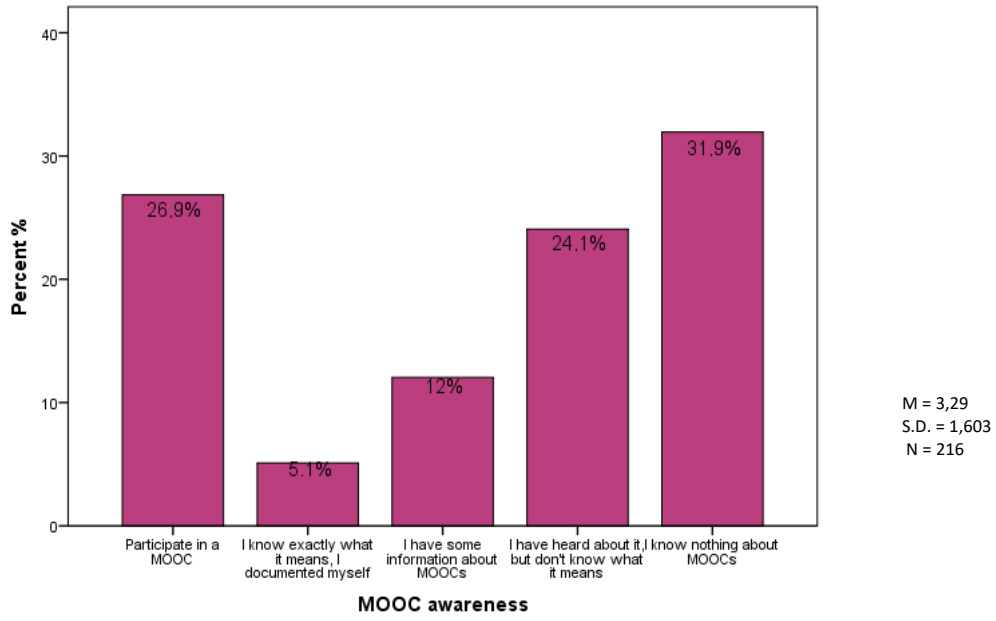
Profile	**Items**		**Percentage (%)**
Access and use of technology	Device mainly used for internet access	Desktop	25,9
		Laptop	53,7
		Smartphone	17,1
		Tablet	3,2
	Internet access via stable home connection	Yes	97,7
		No	2,3
	Internet use	Always (every day)	97,2
		Often (2-3 times per week)	2,3
		Sometimes (once a week)	0,5
		Rarely (once every few weeks)	0
	English language knowledge level	I don't speak English	4,6
		Basic user (A1-A2 level)	17,6
		Independent user (B1-B2 level)	27,3
		Proficient user (C1-C2 level)	50,5
	Prior fully online learning experience	Yes	62,0
		No	38,0

Below follow the results corresponding to research questions.

Q1: What is the level of awareness of MOOCs and MOOC providers among teachers?

The results here were fairly shared among the possible responses (Figure 2). However, for the most part, participants seem to have low awareness of MOOCs. At the same time, low levels of awareness have also been reported on the most popular foreign and Greek MOOC providers, while Coursera (13%) and Greek Mathesis (10.6%) are mainly used.

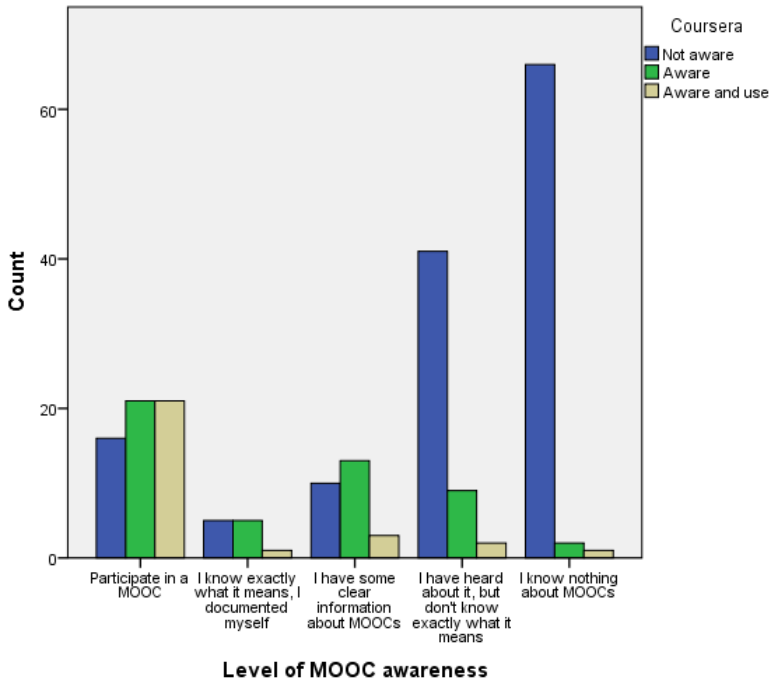
Figure 2: MOOC awareness



Q2: Is there simultaneously awareness of the MOOC concept and non-awareness of MOOC providers and vice versa?

To answer this question, further investigation of the responses about awareness of MOOCs and MOOC providers was conducted by using the "Crosstabs" command. The results showed that there is overlapping of responses, that is, individuals stated that they are aware of MOOC providers but are not aware of the concept of MOOCs. Indicatively, one of the relevant figures is shown below (Figure 3).

Figure 3: Crosstabs MOOC awareness and Coursera (Total sample)



Q3: What is the level of online learning readiness?

The level of online learning readiness was examined using the OLRS scale. The average values for the subscales were calculated, and the higher the price, the more positive the corresponding attitudes. In particular, the results showed quite high average values for both the total sample (Table 5) and the subsamples (Tables 6 and 7), so it can be concluded that the participants show a sufficiently high level of online learning readiness.

Table 5: Descriptive statistics OLRS (Total sample)

	N	Minimum	Maximum	Mean	S.D.
Computer and internet self-efficacy	216	2	5	4,44	,65
Self-directed learning	216	2	5	4,13	,59
Learner control	216	2	5	3,94	,68
Motivation for learning	216	3	5	4,39	,58
Online communication self-efficacy	216	1	5	3,91	,80
Valid N (listwise)	216				

n=216

Table 6: Descriptive statistics OLRS (Sample A)

	N	Minimum	Maximum	Mean	S.D.
Computer and internet self-efficacy	147	3	5	4,53	,57
Self-directed learning	147	3	5	4,13	,56
Learner control	147	2	5	3,93	,65
Motivation for learning	147	3	5	4,40	,55
Online communication self-efficacy	147	2	5	3,99	,73
Perceived benefits	147	3	5	4,05	,49
Perceived usefulness	147	2	5	3,75	,59
Valid N (listwise)	147				

Note: It concerns the dimensions of online learning readiness, perceived benefits and perceived usefulness

Table 7: Descriptive statistics OLRS (Sample B)

	N	Minimum	Maximum	Mean	S.D.
Computer and internet self-efficacy	69	2	5	4,24	,77
Self-directed learning	69	2	5	4,12	,65
Learner control	69	2	5	3,96	,73
Motivation for learning	69	3	5	4,37	,61
Online communication self-efficacy	69	1	5	3,75	,91
Valid N (listwise)	69				

Note: It concerns the dimensions of online learning readiness

Q4: Is there a variation in levels of online learning readiness and readiness for learning in MOOCs among those who are aware of MOOCs and those who are not at all aware?

For this analysis, One Sample t test was run between the two distinctive samples that emerged based on the awareness or not of the MOOCs (Table 8). In more detail, the mean values of OLRS subscales of Sample A were considered to be the comparison values and the corresponding mean values of Sample B were the variables under consideration.

Table 8: One sample t test-OLRS

	Mean (Sample B)	Test value (Sample A)	t	df	Mean Difference	Sig. (2-tailed)
Computer and internet self-efficacy	4.24	4.53	-3.108	68	.288	.003
Self-directed learning	4.12	4.13	-.106	68	-.008	.916
Learner control	3.96	3.93	.358	68	.031	.721
Motivation for learning	4.37	4.40	.363	68	.027	.718
Online communication self-efficacy	3.75	3.99	-2.148	68	.236	.035

According to the above results, statistical difference exists only in two of the five dimensions, but it is quite small. Therefore, online learning readiness level of the teachers who have awareness of MOOCs (Sample A) is similar to that of teachers without awareness of MOOCs (Sample B). However, it can be said that there is room for improvement of Sample B readiness with respect to the two dimensions observed.

Finally, on the variation of the MOOC learning readiness level between the two samples, one sample t test was carried out. In particular, the mean value of Sample A is 3.67. For Sample B M=2.95 was obtained, which is lower than Sample A and statistically differs by 0.723 with t=-6.124, df=68, $p<0.001$. The statistical significance is $p<0.05$, therefore the null hypothesis is rejected, so there is a difference between the two samples.

Q5: What are the attitudes towards the benefits of MOOCs?

These attitudes concern Sample A that responded to the entire questionnaire. According to the results, as Table 9 reports, the mean score of the MOOC benefits scale was found 4.05, meaning there are generally positive attitudes. Then, a more detailed exploration of the individual elements of this scale was made (Table 9). At this point, the advantages of choosing courses from various educational institutions, the time flexibility offered and the possibility of combining with other forms of learning have been emphasized.

Table 9: Descriptive statistics of MOOC perceived benefits-individual elements

	N	Minimum	Maximum	Mean	S.D.
MOOCs involve lower costs than traditional courses	147	1	5	3,89	1,01
Each participant may choose their appropriate moment (own schedule and rhythm) to get involved into	147	2	5	4,37	,77
Short-time courses	147	1	5	3,67	,91
MOOCs propose up-to-date topics and information	147	2	5	4,13	,73
Training offer is diverse and covers the most specific training needs	147	2	5	4,12	,75
One may choose MOOCs provided by various educational establishments (foreign universities, organizations)	147	1	5	4,43	,74
One may acquire the necessary competences for their professional development	147	1	5	3,71	,92
Broaden collaboration and networking	147	2	5	3,92	,89
Possibility of combination with other forms of online or traditional learning	147	3	5	4,24	,69
Valid N (listwise)	147				

Q6: What are the attitudes towards the usefulness of MOOCs in teachers' professional development?

These attitudes concern Sample A that responded to the entire questionnaire. According to the results, as shown in Table 9 above, the mean score of the scale of MOOC perceived usefulness in professional development was 3.75, a value, that even though not particularly high, is above the average, so the attitudes of teachers are considered positive. Then, the individual elements mean scores of the scale were investigated (Table 10). The results emphasize the usefulness of MOOCs in improving the level of knowledge and skills, the use of MOOCs in order to explore knowledge and skills as well as the desire to establish MOOCs in Greek universities. Moderate attitudes have been observed regarding the recognition of certificates and the quality of the courses.

Table 10: Descriptive statistics of MOOC perceived usefulness-individual elements

	N	Minimum	Maximum	Mean	S.D.
MOOCs can improve my job performance	147	2	5	3,80	,83
MOOCs can improve my knowledge and skills level	147	3	5	4,18	,65
Overall, staff development through MOOCs can improve the quality of education	147	2	5	3,83	,81
I feel positive about using MOOCs to further my skills and knowledge	147	2	5	4,13	,70
MOOCs can give me the same quality of knowledge and skills as face to face learning	147	1	5	3,24	,99
I would like to see MOOCs established in all the Greek universities	147	1	5	4,05	,85
MOOC qualifications are acceptable and recognized by my professional organization/body	147	1	5	2,82	1,01
I would encourage my colleagues to try MOOCs for their professional development	147	2	5	3,95	,83
Valid N (listwise)	147				

Q7: How do the level of online learning readiness and the attitudes towards the benefits and usefulness of MOOCs differ depending on the characteristics of the participants?

Correlations were investigated using normality tests ($p>0.05$), such as Independent Samples t-test, One Sample Test and one way Analysis of Variance (ANOVA). At the same time, during ANOVA conducting, a post hoc analysis was performed using the Bonferroni criterion, whereas the LSD criterion was used alternatively in the cases that there was no statistical significance ($p>0.05$) based on Bonferroni criterion. Also, in some cases, due to the fact that one of the answer categories had received only one response, it wasn't possible to perform ANOVA, so multiple t tests were run instead between the rest categories.

Participants' characteristics include demographics as well as other items such as the access and use of technology. Among the characteristics of access and use of technology, it was considered more interesting and statistically significant to explore the variables of the English language knowledge level and the existence or not of prior online learning experience.

Initially, the correlations of the characteristics with the level of awareness of MOOCs and MOOC providers for the whole sample were investigated, since the level of MOOC awareness was the criterion for the separation of the sample. Then, a similar investigation was conducted for the other variables in the distinctive samples. At the same time, it needs to be mentioned that no impact of individual characteristics on the variables of the perceived benefits of MOOCs and the perceived usefulness of MOOCs in professional development was found. Still, impact of individual characteristics was found in the scales of awareness of MOOCs and MOOC providers, as well as in the OLRS dimensions in the sub-samples. Thus, some important correlations have emerged, the analysis of which follows below in Tables 11, 12 and 13.

Table 11: Correlations-Awareness of MOOCs and of MOOC providers (total sample)

Scale	Individual characteristics	Results (more positive attitudes)
Awareness of MOOCs	Level of education	Paidagogiki academia > master or PhD
	Teaching experience	6-10 years and 21 years and above > less than 5 years

	English language knowledge	Without English language knowledge < independent user
	Prior online learning experience	Higher level of MOOC awareness if prior online learning experience exists
Awareness of MOOC providers	Age	Less than 35 years old > over 50 years old
	Level of education	Master > PhD
	Teaching experience	1-5 and 11-20 years > over 21 years
	Internet use	Every day users > less frequently users
	English language knowledge	Without English language knowledge < independent users
	Prior online learning experience	Higher level of MOOC awareness if prior online learning experience exists

For Sample A there were effects of participant's characteristics on only three OLRS scales, while for Sample B there were effects on four OLRS scales.

Table 12: Correlations-OLRS (Sample A)

Scale	Individual characteristics	Results (more positive attitudes)
Computer and internet self-efficacy	Level of education	master > bachelor
	English language knowledge	Without English language knowledge < basic, independent and proficient user
	Prior online learning experience	Higher level of MOOC awareness if prior online learning experience exists
Learner control	Age	36-49 years old > less than 35 and over 50 years old

	Teaching experience	Over 11 years > less than 10 years
	English language knowledge	Without English language knowledge < basic and proficient users
Online communication self-efficacy	English language knowledge	Without English language knowledge < independent and proficient users

Table 13: Correlations-OLRS (Sample B)

Scale	Individual characteristics	Results (more positive attitudes)
Computer and internet self-efficacy	Prior online learning experience	Higher level of MOOC awareness if prior online learning experience exists
Self-directed learning	English language knowledge	Without English language knowledge < proficient users
	Prior online learning experience	Higher level of MOOC awareness if prior online learning experience exists
Motivation for learning	English language knowledge	Without English language knowledge < basic < independent < proficient users
	Prior online learning experience	Higher level of MOOC awareness if prior online learning experience exists
Online communication self-efficacy	English language knowledge	Without English language knowledge < independent and proficient users

Q8: Do the general attitudes of teachers' MOOC learning readiness affect their attitudes on online learning readiness, perceived benefits and perceived usefulness?

In order to answer this question, Pearson's Correlation Coefficient was used for both samples (Table 14).

Table 14: Pearson's Correlation Coefficient (Sample A-Sample B)

	Sample A	Sample B
Computer and internet self-efficacy	r=0,292, n=147, p<0,001	r=0,374, n=69, p=0,03
Self-directed learning	r=0,262, n=147, p=0,01	r=0,398, n=69, p=0,01
Learner control	r=0,242, n=147, p=0,03	r=0,187, n=69, p=0,123>0,05
Motivation for learning	r=0,422, n=147, p<0,001	r=0,430, n=69, p=0,001
Online communication self-efficacy	r=0,372, n=147, p<0,001	r=0,488, n=69, p=0,001
Perceived benefits	r=0,421, , n=147, p<0,001	-
Perceived usefulness	r=0,548, n=147, p<0,001	-

According to Table 10, for Sample A, all correlations were statistically significant. However, there is weak, positive correlation between teachers' MOOC learning readiness and their attitudes towards computer and internet self-efficacy, self-directed learning and learner control. Also, there is moderate, positive correlation with attitudes towards motivation for learning, online communication self-efficacy, perceived benefits and perceived usefulness.

Respectively, concerning Sample B, the results showed that the statistically significant correlations between teachers' MOOC learning readiness and the rest of their attitudes were moderate and positive. The only not statistically significant correlation was the one with learner control attitudes.

Consequently, it can be concluded that the association of MOOC learning readiness with the rest of the attitudes is not strong in both samples. Therefore, increase in this level has little chance of positively affecting the rest of teachers' attitudes.

4. Discussion

4.1. Results discussion

The present study was undertaken to investigate the level of readiness of in-service teachers of public primary and secondary schools to use MOOCs for their professional development. For this purpose, data on the demographic and other characteristics of the

participants were gathered and some research questions were raised, the results of which are analyzed below.

The survey involved a total of 216 in-service teachers of various teaching disciplines of public primary and secondary schools. The majority of the participants are women over the age of 35. In addition, teachers' specialties are mainly pedagogical and science teachers, most of them are master graduates and have over 11 years of service.

Regarding the data on access and use of technology, the vast majority of participants has internet access via stable home connection and uses it every day, while they mainly use laptop to access internet. Finally, about half of the teachers have a high level of communication in written and spoken English language and most of them have participated in a full online course.

Teachers' attitudes

Q1: The level of awareness of MOOCs has been particularly low, with views fairly shared. Respectively low levels of awareness were found especially concerning the popular foreign and Greek MOOC providers. These results were expected, as efforts in the development of MOOCs (Kappas & Tsolis, 2018) are particularly limited in Greece. At the same time, the results are generally consistent with the findings of other similar surveys for both teachers (Malita et al., 2018) and the population of workers in general (Castaño-Muñoz et al., 2018; Radford et al., 2014; Ramirez-Montoya et al., 2017; Roshchina et al., 2018).

Q2: It was also found that there were overlapping responses about MOOC awareness. For instance, teachers said they knew MOOC providers but did not know what a MOOC is. This shows lack of comprehension of MOOC concept, as well as possible misunderstanding with other online learning forms. Of course, it is important to note that there is difficulty in measuring the awareness due to the lack of a catholic acceptable measurement (Merikle, 1984), hence influencing the awareness measurement and research findings in general (Allen & Seaman, 2014).

Q3: With respect to the results of teachers' online learning readiness, which was found to be quite high, it is observed that there is also agreement with other similar studies (Hung, 2016; Reeves & Li, 2012), apart from some variation in computer and internet self-efficacy dimension (Mannila et al., 2018; Malita et al., 2018). Nonetheless, a generally high level of online learning readiness is expected, as teachers are familiar with technology, using it in their professional and personal lives (Fox & Bird, 2017) and

in addition, it is in the nature of their work to be motivated to learn, to adapt and to direct the learning process (Avalos, 2011; Louws et al., 2017; Xochelis, 2006).

Q5: Regarding teachers' attitudes about the perceived benefits of MOOCs, they are positive, which is in line with the prevailing view of the advantages of MOOCs (Ji & Cao, 2016; Malita et al., 2018, Shapiro et al., 2017). Notably, particular emphasis was placed on characteristics necessary for the effective professional development of teachers, such as flexibility (Day, 2003, Mahlangu, 2017), while the short duration of the courses was considered as a less positive element (Darling-Hammond et al., 2017).

Q6: Finally, there has been agreement with other studies concerning the positive attitudes of teachers on the perceived usefulness of MOOCs in professional development (Chaiyajit & Jeerungsuwan, 2015; Chen, 2016). Indeed, the positive attitudes towards the establishment of MOOCs in Greek universities are in line with the up-to-date data for the participation of teachers in Greek MOOCs (Mathesis, 2018; Lakasas, 2016). However, some less positive elements such as the recognition of MOOC certificates (Egloffstein & Ifenthaler, 2017; Online Course Report, 2017) and the design quality of MOOCs (Bozkurt et al., 2017) are highlighted, suggesting that there are some challenges that need to be addressed in order for MOOCs to be considered as an important alternative for teachers' professional development.

Correlation results

Q4: One of the research questions was whether or not the level of online readiness and readiness for learning in MOOCs was varied between the two sub-samples. The results showed that both samples have positive attitudes and that there is little differentiation in two of the five dimensions of OLRS that concerned computer use and online communication. This, on the one hand, shows that in general there is no particular differentiation between the samples, but on the other hand it highlights the importance of the technological and communication skills for the online learning readiness (Smith, 2005). In addition, there was a fairly significant variation in the readiness level for learning in MOOCs among the samples, which was expected, since one sample was not aware of the MOOCs at all.

Q7: Another research question concerned the effect of demographic and other characteristics of teachers on their attitudes. The results showed that there were multiple and varied effects on OLRS attitudes in both samples, while no effects on perceived

benefits and perceived usefulness were observed. In an effort to concentrate on the main outcomes, relating to the awareness and readiness scales, it appears that:

- There has been no gender impact on online learning readiness, which is confirmed by other similar studies (Hung, 2016; Hung et al., 2010).
- The lack of age impact on attitudes for technological skills was unexpected, since there is a tendency for younger people to be more informed and capable of using technology than older ones (Vryzas & Tsitouridou, 2014; Monaco & Martin, 2007). However, this trend justifies the higher level of awareness among MOTOC providers by the younger ones.
- Another important element that justifies quite a lot of results is the concept of teachers' professional development phases, meaning the alternations of an educator's behavior through the years and the acquisition of experience (Day, 2003). For example, the fact that younger teachers have more negative attitudes on learner control than the older ones may be justified on the grounds that experienced teachers are at a stage where they manage a variety of professional and personal responsibilities.
- Teachers' level of education has shown to positively influence their attitudes towards computer and internet self-efficacy. This is quite expected, considering the fact that nowadays technology is broadly used during academic studies (Henderson et al., 2016), therefore those who have acquired a tertiary degree in higher education in the last few years are more likely to have used technology during their learning process. At the same time, a high level of education increases the possibility of participating in an online course such as MOOCs (van de Oudeweetering & Argidag, 2018).
- The level of knowledge of the English language was also an element that influenced several teachers' attitudes. Knowledge of the language in which a course takes place plays an important role in the learning and communication process in MOOCs (Abeer & Miri, 2014). Furthermore, individuals tend to prefer to communicate in their mother tongue (Colas et al., 2016; Malita et al., 2018). The fact that most MOOCs are in English makes it difficult for those who do not have a good knowledge of English In addition, the broad dominance of English language in technology and internet terminologies and processes brings difficulties as well (Flammia, 2007).

Q8: Finally, the low positive correlation of teachers' attitudes towards MOOC learning with the rest of their attitudes indicates that there may be little chance that the more positive are the first, the more positive the others will be. However, this relationship is not strong and can be influenced by other factors, but these are not investigated in this study.

In conclusion, the attitudes of teachers in the dimensions used on the basis of the above-mentioned research rationale were positive. Therefore, it can be said that the teachers of the present sample are quite ready to use MOOCs as part of their professional development. This result is consistent with previous research (Arnavut & Bicen, 2017; Gameel & Wilkins, 2019).

4.2. Study limitations

Initially, the investigation of the issue was quite limited due to insufficient resources and time. At the same time, a non-randomized sample was used, so it is not representative of the population and thus the conclusions are not generalizable (Cohen & Manion, 2000). Additionally, a research tool not validated in the Greek concept was used due to a lack of relevant Greek research. Last but not least, the exclusively online data collection is also a limitation, as it is quite possible that those who participate in web-based studies are individuals with specific characteristics (Wright, 2005).

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