

3.2 The Sample and the Procedure

This study adopts a mixed method with survey and interview data collected and analyzed. The study design was based on the work of [7] to get comparable results. The participants were 3rd-year students. Although the study targeted about 160 respondents, a total of 122 valid submissions were obtained, (76 % response rate). After the online survey data were collected, the students were voluntarily asked to participate in the interviews. 25 students took part in the follow-up interviews. All interviews were conducted face-to-face.

A questionnaire asking about the experience of using Moodle was used for collecting quantitative data. It included two parts: demographic information and frequency of course Moodle use. Part 1 asked for basic demographic information as well as their experience with Moodle and self-perceived IT competency level; Part 2 asked about the frequencies of using different categories of Moodle activities with variables in a 5-point Likert scale: ranging from 1 (never) to 5 (several times a day). Some of the questionnaire questions are as follows: “*What did you usually do when you access the Moodle of this course via your phone?*”, “*Did you have any difficulties in using the Moodle of this course using your mobile phone? If yes, what were they?*”, etc.

4. Results

4.1 Questionnaire Responses

Table 1 shows the statistics of student self-reported usage of Moodle via mobile phones. Access to learning materials was the most frequent activity, while interacting with instructors and other students were the least frequent one.

Table 1. Students usage of Moodle via smart mobile phones.

Moodle activities	Mean	SD
Accessing resources	3.8	1.12
Submitting assignments	1.3	0.26
Taking tests	2.1	0.71
Interaction	1.5	0.33
Collaboration	1.1	0.17

Experience of using Moodle may have affected students’ usage of Moodle via mobile access. We used Kruskal–Wallis tests as a non-parametric equivalent of the ANOVA control. The tests revealed that students with different Moodle experience reported significantly different usage frequency ($p < .05$). Follow-up pair-wise tests revealed that students with “2 years’ or more”

experience with Moodle reported higher frequencies than those with “less than 1 year” or “1 year to less than 2 years” experience. Besides, a difference in the frequency of using Moodle via mobile phones across IT competency was also analyzed. As a statistically significant difference of access frequencies in interaction and collaboration activities was found ($p < .05$) a follow-up pair-wise test was used by the researchers. It was found that students who rated themselves as “competent” reported significantly more frequent access than those who rated themselves as “not or somewhat competent” or “less competent.” There was no significant difference between other pairs of IT competency values. These results are completely different compared to the work of [5]. As all the students of the Department of Preschool Education were females in this study, there was no gender-based statistical analysis.

3.2 Interview Responses

The semi-structured interviews were conducted after a regular university day. A separate isolated room was used to avoid distractions and outside influences. All students interviewed answered that they used mobile phones to access the Moodle of their courses, as mobile phones allowed them to access the LMS at any place and anytime. Mobile access also enabled them to read announcements, comments, and feedback as soon as they were available online. At the same time, they also stated that they preferred content to be more well-organized and clearly presented in comparison with the LMS access via desktop PCs, due to the technological limitations of smart mobile devices. For example, some said they preferred to see the necessary announcements as soon as they accessed the application to feel more comfortable with the course content or they reported the inability to find information in a quick and efficient way. Students’ tendency in using Moodle for resource depository and information retrieval in this study demonstrated consistency with previous studies on students’ perception on Moodle [4, 43]. Students statements (Table 2) revealed that they see LMS as a complement rather than a substitute for the formal class.

Table 2. Students representative answers.

Moodle activities	Sample views
Accessing resources	<i>It may be a convenient option to see changes in the material made by the professor. On the other hand, one respondent expressed a worry that the mobile access stressed her out as she felt she should constantly check her phone for new updates, similar to the ‘Facebook-syndrome’.</i>
Submitting assignments	<i>I do not use it because I find it a cumbersome process.</i>
Taking tests	<i>Most importantly, it gives me a sense of</i>

Interaction	<i>freedom, as I am not obliged to constantly sit in front of a PC. It's very easy to access, so sometimes you end up sitting at a cafe and checking whether there is anything new.</i>
	<i>If there was no social media, the system would be important for communication with instructors and other students. I prefer to use other social media platforms, such as students' closed group on Facebook.</i>
Collaboration	<i>Although I own a mobile device with a large touch screen, I prefer for this type of activities to work on my PC.</i>

In general, students indicated that using mobile phones was not a preferred method to access Moodle. Although there are mobile device monitors with larger screens - which can render higher resolutions at more readable sizes - students still referred to usability issues such as the screen size. Thus, they would only be comfortable to conduct simple and low-stake tasks using mobile access (see Figures 3 and 4).

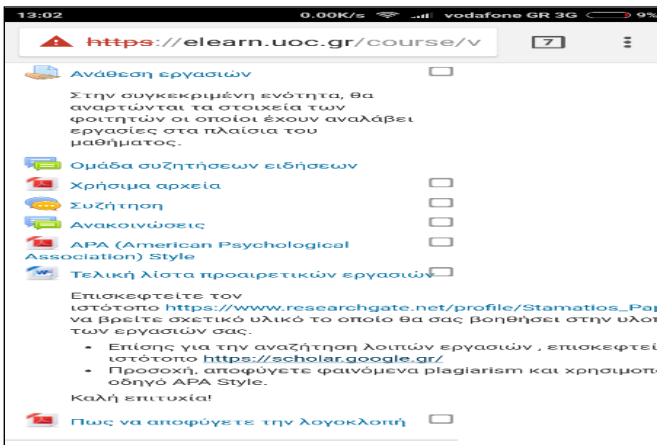


Figure 3. Moodle content in a 5.5-inch mobile device screen.



Figure 4. Moodle content in a 5.5-inch mobile device screen.

4. Discussion

This study set out to investigate how university students perceive the use of learning management systems. During the years, various attempts to evaluate LMSs and especially Moodle as an effective learning tool have been successfully made. The majority of the studies concluded that LMSs -including Moodle - are inadequate in supporting the level of interaction, personalization, and engagement demanded by the tech-savvy students [4, 7, 43, 45]. In fact, many studies have reported that if we want the LMSs to be used less as electronic document repositories and more as active learning tools it is necessary to provide to the new generations of students that were 'born with smartphones' and are very familiar with the latest technologies the right tools to access the educational content. At the same time, at least one study has found that students did not prefer using their mobile phones to access Moodle, due to the limitations of mobile access on usability and reliability [20].

Motivated by the above-mentioned studies, the novelty in this paper is that it is focused on the use of smartphones by the students. As many studies show, the success of web-based learning systems will not be achieved if students fail to use such systems [45]. Both the survey and interview data indicated that students used mobile phones to access Moodle for learning materials much more often than for other uses, which indicates that the use of mobile access to Moodle was still at the lowest level as suggested in [15]. To sum up the approaches which, based on student's evaluation, could make the smartphone experience better and thus push them to use the LMS more often and more efficiently are:

- Better organized web content
- Better organized web structure (e.g. nonuse of cluttered navigation bar and/or Long drop-down menus)
- A powerful, flexible, and engaging online learning experience
- Familiarity and experience with mobile technology

It should be highlighted that the students didn't use the Moodle mobile application to access web content due to University security policy. If the students were able to use the Moodle official application, they should have a better learning experience.

Incomplete system use signifies that the LMS is perceived as a tool with a few isolated functions, not as the 'multi tool' the system it is designed to be [43]. Like other studies [7, 42, 43], the major findings from the results show that students' perception of the LMS is affected by several factors related to social influences, perceived easiness to use and perceived usefulness. Students highlighted that mobile phones present usability and compatibility problems while trying to access websites meant for desktop or laptop computers. Thus, this is one of the main reasons why students do not prefer mobile access for accessing the LMSs. If mobile phones are to be used to effectively access LMSs, the LMSs must be

optimized for mobile access. This could happen through the provision of a few selected services by the instructors, with the necessary detail for each service. The design challenge is to optimize the LMS in such a way that the mobile site satisfies at least most of the mobile users' needs for the LMS [42]. Therefore, managers and developers of e-learning need to improve the content quality of their e-learning systems to encourage students to use them more extensively [45]. Furthermore, the findings of this study, like other studies, emphasize the importance of the LMS delivering quality content to its users, as well as the fact that it is up-to-date, easily available and relevant [1, 31, 43, 45]. In contrast to other studies such as the ones reported by [43], the students didn't report that the LMS contained a lot of unnecessary information.

In this study, like those reported by [7], the results suggest that simply the creation of Moodle activities that are designed for interaction and collaboration does not necessarily result in more frequent access to those activities via mobile phones. Besides, instructors and teaching assistants need to be more responsive and more active in facilitating student interactive activities. As [43] indicate the teacher's way of using the system is a major source of influence on how students perceive and use an LMS.

The results also revealed that students who had used Moodle for a longer period tended to use mobile access more often to take tests and collaborate on Moodle than those who had used Moodle for less time. In addition, students with high self-perceived IT competency used more mobile access to Moodle for interaction and collaboration activities. These seem to comply with many studies where experience and IT competency are positively associated with technology usage [9, 14, 24, 26].

4.1 Limitations

The main source of bias for this study could be the fact that the first author was the person who designed this study, was the teacher in the groups and collected the end-test data. The evident conflict of interests and potential bias could genuinely affect the validity of this study.

5. Conclusion and Future Work

New technologies provide teachers with many interesting tools that can be used to improve the teaching-learning process [28]. Recent technological advances have led universities to an introduction of innovative modes of teaching and learning. Studies have found that students may react differently to the online learning environment, depending on their skill level and attitude [13]. Moodle is a leading open source e-learning management system. With Moodle, educators can easily construct richly textured web-based courses. A course can consist of a

number of lessons. Each lesson consists of reading materials; activities such as quizzes, tests, surveys, and projects; and social elements that encourage interaction and group work among students [39]. In general, students in this study did not prefer using their mobile phones to access Moodle due to the limitations of mobile access on usability and reliability. However, most of them indeed used mobile phones to access Moodle when it was necessary. In terms of Moodle activities, it was found that students preferred carrying out easy and low-stake Moodle tasks on their mobile phones, such as accessing learning materials. The students expressed the need for a more user-friendly mobile access. Thus, in accordance with other studies our research concludes that it is the well-organized and clearly presented content that will make LMS a complement rather than a substitute for the formal class. Moreover, the findings of this study and all reported studies included in this paper as well, point out the necessity of active and competent users of technologies and modern digital equipment available, as well as smart mobile phones and/or tablets.

This study, much like other studies of similar nature, had limitations. A possible limitation is that the data collection was limited to a single university department in Greece. Follow-up studies can expand the sample by recruiting participants from different universities and in different regions. Another limitation is that the findings of this study are solely based on self-reported data from participants, which might be subject to the difference in students' own perception. Future studies could rely on objective data sources such as the usage patterns as reflected in the LMS system logs. Additionally, as it is clear from the results, the students' perceptions reflect issues that are both technical and social in nature, a fact which in many ways supports previous research on user acceptance of the technology. So, it will be of interest in future studies to try to identify, the individual, organizational, and technological factors that could be influencing the use of LMS, using the Technology Acceptance Model.

The feature of blended learning on which we would like to focus is the increasing emphasis on 'learner collaboration' [15]. We soon expect the use of LMS in the University of Crete to be being utilized closer to Francis and Raftery's Mode 2 as students make more use of communication and collaboration tools.

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The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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