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The place of practical courses in formal and natural science fields in the Algerian universities during the pandemic: Examples from the University of Msila

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The place of practical courses in formal and natural science fields in the Algerian universities during the pandemic: Examples from the University of Msila

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Abstract

The outbreak of the pandemic and enforcement of social distancing in 2020 presented the Algerian higher education with challenges that were barely taken into consideration. Adhering to distance learning has become necessary, and timetables encompassed a mixture of face-to-face and distant courses. The aim was imposing measures that can help control the number of individuals present within colleges to prevent any further outbreaks of the disease at universities. These regulations, however, seemed indifferent to natural and formal science disciplines which require practical classes. This paper reviews the timetables of final classes in the departments of biology and computer science in the University of Msila during the pandemic as compared to those of previous years. Comparison shows that practical courses' assigned hours per semester were cut to less than a half, which may negatively impact students' future academic and professional careers. The first solution that this paper proposes for this issue is to consider the replacement of theoretical courses that require attendance with practical courses; wherein theoretical courses are preserved merely for distance learning. Additionally, higher education institutions can also plan distant practical classes that are broadcasted from within the institutions' laboratories.

Keywords: Pandemic, Computer science, Biology, Practicalcourses, Distance learning, Face-to-face learning.

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Introduction and problem

The outbreak of COVID-19 pandemic at the beginning of 2020 presented the whole world with new challenges that forced the societies to adapt to it. Social distancing imposed the lockdown of places that would present individuals with the threat of further spread of the disease due to large numbers of persons attending them; educational institutions, including public schools and colleges, were no exception to the rule.

On the 17th of February 2020, the first case of COVID-19 was recorded in Algeria only to be announced a few days later (France24, 2020). Needless to say, citizens seemed to underestimate the situation earlier, which resulted in a rapid increase in the number of cases per day. By mid-March, the ministry of Higher Education and Scientific Research issued a decree that ordered all universities and university dormitories to shut down (Algeria Press Service, 2020). The lockdown was planned to end by early April, however, the social distancing measurements did not seem to prevent any further outbreaks, resulting in the prolongation of the lockdown of educational institutions until early September of the same year.

Calls for initiatives to get students back to classes intensified, and the ministry decided to reopen universities provided that colleges adhere to a new plan to prevent the spread of the disease inside universities. The plan divided students based on their level into two or three groups that each study separately during different weeks. This plan proposed a mixture of in-person and distance learning (which were mostly carried out online). The proposal suggested that a certain group receives online courses at home, while the other would attend face-to-face classes in college, only to have them switch places after a week or two.

Such a plan proved to be difficult to implement at first. Difficulties were later overcome to a great extent when teachers received training on how to provide lessons online through

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platforms like Moodle, Google Meet, and Zoom. Also, the ministry provided free access to Moodle for students who could not afford access to the internet. Nevertheless, the number of practical courses, especially for students of formal (mathematics, computer science, etc.) and natural (physics, biology, chemistry, etc.) sciences, to whom these courses are a crucial part of professional training above all, remained a disputable point.

The number of weeks through which the assigned timetables have been distributed this year has been reduced. At first sight this appears to affect the number of overall classes that students may have. Hence, this paper's objective comes to the forefront. That is, it reviews the changes that underlied the scheduling of practical courses for selected classes of computer science and biology, through a comparison with that of last year. This comparison aims at defining the main problems with such scheduling and proposing possible solutions to overcome them.

1. What is practical work?

In his report on "The Role of Practical Work in the Teaching and Learning of Science," Robin Millar employs the term "practical work" to designate "any teaching and learning activity which at some point involves the students in observing or manipulating the objects and materials they are studying" (2004, p.2). This description seems relevant within to the fields of formal and natural sciences, whose nature entails an indispensable need for practical work. They especially require first-hand activities in order to immerse the learner into the 'objects and materials' being studied and help improve their proficiency in dealing with problems that may arise within their field of expertise. This in turn, can be said to acquaint them with the necessary knowledge for post-graduation professional and academic life in industries and research centers or elsewhere.

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2. Data collection

In order to review and compare the hours per semester of practical courses for 3rd year classes of Information Systems (computer science department) and Master 2 students of Plant Biotechnology and Improvement (department of biology) in the university of M'sila, we used the timetables for both semsters of this year and the previous year. The timetables were procured either from the faculties' websites[1] or the departments' Facebook pages[2][3].

The choice of scientific and technical fields for this paper is based on the importance of practical courses for their students. Choosing senior classes, on the other hand, is because they can be more susceptible to the adverse effects of insufficient practical courses as compared to younger students. This is essential because they are a step away from professional life.

3. Comparing the timetables

Using timetables of both semesters forsenior classes, 3rd year License and Master 2, of Information Systems (department of Computer Science) and Plant Biotechnology and Improvement (department of Biology) respectively, the following tables could be obtained.

The following tables represent the hours assigned for practical courses per semester for 3rd year students of information systems (Table 1.) and Master 2 students of plant biotechnologyand improvement (Table 2.).

[1]Faculty of science: http://virtuelcampus.univ-msila.dz/facscience/

[2]Department of natural sciences, https://www.facebook.com/D%C3%A9partement-des-sciences-de-la-nature-et-de-la-vie-178065872879422/

[3]Department of computer science, https://www.facebook.com/depinfmsila

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1st semester before the pandemic (hours/ semester (14 weeks))	2nd semester before the pandemic (hours/ semester (14 weeks))	1st semester during the pandemic - distance learning	1st semester during the pandemic – face-to-face learning (3 weeks)	2nd semester during the pandemic - distance learning	2nd semester during the pandemic –face-to-face learning (4weeks)
Human-machine interface *21h/ semester*	Mobile applications *21h/ semester*	Human-machine interface 2h/ semester (a single session planned by the teacher)	Human-machine interface8h /semester	None	Mobile applications 7.5h/semester
Software engineering *21h/ semester*	Artificial intelligence *21h/ semester*	None	Software engineering 8h/ semester	None	Artificial intelligence 7.5h/semester
Translation (compilation) *21h/ semester*	Semi-structured data *21h/ semester*	None	Translation (compilation) 8h/semester	None	Semi-structured data 7.5h/semester
Operating system *21h/ semester*		None	Operating system 8h/semester	None	

Table 1 :*Assigned hours of practical courses for 3rd year classes of information systems (IS) before and during the pandemic*

Table 1 demonstrates the hours per semester for major modules' practical courses before and during the pandemic for 3rd year students of information systems. For both semesters, the usual number of hours per semester for practical courses is supposed to be 21 hours, distributed across 14 weeks, with an average of 1.5hours per week.

The situation during the pandemic imposed a new schedule that used three weeks during the first semester, and four weeks

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during the second. Scheduling timetables remained roughly the same, and the average number of classes per week for practical courses was barely altered. This resulted in planning 8 hours per semester in face-to-face learning for each of Human-machine interface, Software engineering, and Translation, in addition to two additional hours presented on a distance course by the teacher of Human-machine interface. The average numberof hours per semester for practical courses of the second semester was approximately the same; the only difference was that the schedule featured 1.5hours for a course instead of 2hours during the month of Ramadan. This resulted in having an average 7.5hours per semester in Mobile applications, Artificial intelligence and Semi-structured data.

1st semester before the pandemic (hours/ semester (14 weeks))	1st semester during the pandemic –face-to-face learning (3 weeks)
Plant products biology and bio-industry 3h/ 2 weeks (21h/ semester)	Plant products biology and bio-industry 2h/2 weeks (about 4h-6h/semester)
In vitro culture technologies 1.5h/ week (21h/semester)	In vitro culture technologies 1h/week (about 3h-4h/semester)
Methodology and approaches for plant genetic improvement 1.5h/week (21h/semester)	Methodology and approaches for plant genetic improvement 1h/week (3h-4h/semester)

Table 2:*Assigned hours per semester of practical courses for Master 2 classes of plant biotechnology and improvement (PBI) before and during the pandemic*

As for Table 2, the considered practical courses are those of the first semester since the second semester is preserved for the preparation of a Master's thesis. Master 2 students of PBI generally have three major practical courses: Plant products biology and bio-industry, In vitro culture technologies and

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Methodology and approaches for plant genetic improvement. The average number of hours per semester for each of these courses was previously 21 hours; however, during the pandemic the number of hours is eminently reduced to 3-6hours per semester.

4. The problem with scheduling practical courses

Choosing senior classes to review the amount of practical work courses that students have per semester was not a random choice. Students of formal and natural sciences usually build their respective disciplines' practical scientific knowledge through such courses, which help them have a better understanding of their fields, and possess adequate professional knowledge which they can put into practice when they are hired for a future job(Millar, 2004, p.2). This knowledge is especially beneficial for senior students who will be directed to professional life shortly after graduation.

For 3rd year students of IS, courses like Human-machine interface and Mobile applications, for instance, are both crucial in equipping the student with a better understanding of how to develop android applications' backend and frontend which can simply adapt to the users' needs to provide them with an effective experience while using the applications. Software engineering is also another essential course for students of IS, as it consists of how to create, maintain and even improve software. This suggests how crucially it can help a student through with their graduation project as well as later in professional life.

Moreover, 3rd year students in the department of computer science had a workshop designed especially for extensive training on the development of applications for their graduation projects. The workshop was supposed to be scheduled during the second semester with a sum of 21 hours per semester. Needless to say, this course have been entirely left out of the timetable for the second semester this year.

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Master 2 students of PBI also benefit significantly from practical courses. Plant products biology and bio-industry offers insights into plant-derived production, and how to extract and use them in various products. The other two courses, In vitro culture technologies and Methodology and approaches for plant genetic improvement, provide training on methods of plant multiplication and improvement both in artificial environments and through safe genetic manipulation. This provides a graduate of the discipline with due expertise to engage in related industries and research centers.

What is initially apparent in the timetables assigned for students of the selected disciplines is that the number of hours allocated for practical courses is cut for less than a half during the pandemic. Given the significance of these classes for training students for future careers, cutting the hours per semester required to finish the curriculum can obviously exert unfavorable effects on students' academic and professional training. Hence, considering possible solutions for this problem is requisite.

5. Proposed solutions and conclusion

The reduction of the required hours per semester to finish practical courses' curriculum is mainly a consequence of using face-to-face learning timetables similar to the ones from previous years without considering the current situation's course of actions. Not taking distance learning and the planning of theoretical courses into consideration for the appropriate scheduling of practical courses is another issue. Mindful consideration of these problems could have contributed to mitigating the defects of such uncalculated plans.

Basantia (2018, p.202-203) differentiates theoretical courses from practical ones based on modes and methods of implementing them. Yet, he also states that a major difference in addition to combining both theoretical and first-hand activities in practice-based courses (unlike in theoretical courses), is that of

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executing them within settings of distance learning. Particularly, practical courses can be challenging to present online, but this remains applicable if the appropriate measures were taken.

It is during such situations as a pandemic that ways for teaching practical classes become disputable. Imposing a plan that uses a mixture of in-class and distant courses in Algerian universities could have helped overcome some major obstacles for students to attend practical courses online, had it been properly implemented. This, however, was not the case. In exchange for providing a solution within which classes could be held without breaking social distancing rules, the uncalculated scheduling of sessions resulted in reducing the number of practical courses for students of scientific and technical disciplines.

What this paper presents as potential solutions to this issue is bipartite. The first tolerable solution starts by critiquing the inclusion of theory-based classes into both distance andface-to-face learning schedules.Whenever theoretical courses can be reserved for distant learning, practical courses could take their place in face-to-face sessions. This will result in approaching the usual average hours per semester allocated for them previously.

In the case of students of IS, daily online theory-based classes were scheduled whenever they were not concerned with face-to-face classes. However, in-class learning schedules included the same number of sessions per week for these theoretical courses as previous years. The inclusion of theoretical courseshappened at the expense of practice-based classes whose hours per week remained the same while the number of weeks decreased, and there were no actual plans to include them in distant learning schedules. Since theoretical courses do not require the first-hand experience that practical courses do, it could be more effective to preserve theoretical courses for distance learning. Accordingly, timetables would have sufficient time to allocate to practical in-class courses for students.

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Another solution is to include practical courses in the timetables of distance learning; this is especially for pratical courses that only require observation on the student's part. These courses can take place in college laboratories (eg. for biology and chemistry students), or even in the teacher's home if no further equipment or supplies are needed (eg. for computer science students). They can be broadcasted through an online learning platform. This, however, can be faced with a major issue if the classes do not require mere observation, but also reenacting practices by students. In such disciplines as computer science, for instance, students may not have the equipment to perform the practice they learn online. An instance that is worth mentioning is the attempt that the Human-machin interface teacher made to provide an online practical course. The teacher was faced with the very problem of equipment that students did not have access to, resulting in no more such courses.However, this disadvantage can be metigated through opening multimedia classrooms for students to access during their face-to-face learning weeks under the supervision of teachers.

What the previous year presented the world with still has today bear its consequences since the pandemic is still ongoing. Challenges to educational systems in particular were difficult, especially in countries where adhering to distance education can be problematic, as is the case in Algeria. The plan that proposed resorting to a mixture of face-to-face and distance learning in particular was problematic. Especially for its reduction of weeks per semester and the inadequate planning of practical sessions within timetables of formal and natural science disciplines.

This paper offered a review of the timetables assigned to senior students of information systems and plant biotechnology and improvement. This review showed that while theory-based courses were held both in in-class and online settings, practical courses were largely ignored, and the hours per semester allocated for them were cut to less than a half. What follows from this is a

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weak practical training for students of the two disciplines that may result in a slow, even difficult and intractable, adaptation to professional settings, not to mention the poor academic achievement. After all, the rate of students who passed the sixth semester exams successfully, without being excluded or having to pass the resit exams was barely 44%[4].

The paper proposed two main solution to the problem concerning the effective implementation of practical classes within the ministry's proposed plan. Preserving theory-based courses to distance learning and replacing most of their planned in-class courses with practical ones is one solutions. The other solution is preparing settings that facilitate the inclusion of practical courses into the timetables planned for distance learning. This may be possible for practical courses that only require observation on the part of the student.

Whether or not the pandemic will end before the beginning of the next academic year is something that is yet unknown. However, the ministry is seriously studying the effective implementation of such plan as this year's in the schedules of years to come.Notwithstanding, whether or not efforts will be taken to improve the experience of both teachers and students in having practical courses planned within such schedules is yet undetermined.

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