

Monitoring students' attendance in synchronous teaching/learning activities for online classes: a challenge for university's teachers

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Abstract: *During the last two years, the academic space was under the formidable pressure of online teaching, caused by the pandemic disease spread all around the world. In this context, teachers from colleges and universities tried to adapt teaching methods and strategies for monitoring students' learning in appropriate ways. Using frequently technological tools or conference apps as Webex or Zoom, teachers discover some useful opportunities and functions of these apps. Students' attendance on face-to-face academic activities as courses or seminars were realized by students themselves by writing down the name on a piece of paper. On the other hand, the online apps offer sometimes some technical opportunities to monitor the student attendance through a small but effective program, added to the main application. This represents an elegant and accurate manner to monitor students' attendance, useful for teachers who adopted it. This article presents a simple, free and accessible online software tool that is useful in monitoring students' attendance providing a report about the frequency and duration of student participation in online courses conducted through the Webex application.*

Keywords: COVID-19, Webex, attendance, university.

1. Attendance of university students during COVID 19 – an overview

Higher Education Institutions (HEIs) are interested in the rate and quality of students' attendance, for financial or administrative reasons, but also for the quality of undergraduates. Student absenteeism is a problem in universities, for example in medical education (Sharmin et al., 2017). As in face-to-face education, the absenteeism is a significant problem in online education, especially in HEIs. Mokhtari, Nikzad, Mokhtari, Sabour, Hosseini (2021) says online education is a proper solution for reducing absenteeism in lecture classes, and the online presence of students is critical for authentic and effective instruction.

But what does *attendance* mean in an online context, as was imposed worldwide by COVID 19 breakdown? According with Federal Student Aid Handbook, some acceptable indications of attendance in an online course can be: student submission of an academic assignment; student submission of an exam; documented student participation in an interactive tutorial or computer-assisted instruction; a posting by the student showing the student's participation in an online study group that is assigned by the institution; a posting by the student in a discussion forum showing the student's participation in an online discussion about academic matters; an email from the student or other documentation showing that the student-initiated contact with a faculty member to ask a question about an academic subject studied in the course. (<https://teaching.resources.osu.edu/keep-teaching/attendance-online-classes>). The same document underlies that is not *attendance* "in a distance education context, documenting that a student has logged into an online class is not sufficient, by itself, to demonstrate academic attendance by the student" (Federal Student Aid Handbook, 2016, p. 886).

University students' attendance is often associated with other desirable academic behaviours such as engagement with the courses content, willingness for their academic success, and educational attainment (Moores, Birdi & Higson, 2019). Credé, Roch, and Kieszczynka (2010), in a meta-analysis find class attendance represents the most accurate predictor of academic achievement. Students' attendance significantly varied in relation with universities policies and expectation, but also depending on institutional or individual standards: some teachers award grades for a good rate of attendance; in some classes students' attendance is mandatory. In another meta-analysis on the relationship between students' attendance and academic performance (Crede et al., 2010), the authors find that those with high performance have also very good attendance and students with lowest mark have most likely very poor attendance.

Weijers, Ganushchak, Ouwehand & de Koning (2022) says class attendance is equally important in face-to-face and online education (Nieuwoudt, 2020), there are specific challenges related to attending online classes. For example, for an online class, it is easier for students to pretend to be present and to not login into the online class altogether, and it is more difficult to enforce class attendance compared to physical classes (Archambault et al., 2013). During the COVID-19 pandemic, online class attendance has become even more challenging and teachers have reported a significant drop in class attendance (Meeter et al., 2020). For all these reasons, creating and using digital tools for monitoring online attendance and for effective instruction of the students are very useful.

2. The Webex Usage Report Generated Weekly by the Teacher

Since the beginning of the COVID 19 pandemic stage one, in Romania the first case was declared on February 26, 2020, the companies that had online audio-video communication applications in their product portfolio made their product

available free of charge to educational institutions. One of these companies is CISCO, which has in its portfolio the Webex application that the teachers from the “Alexandru Ioan Cuza” University of Iasi use for distance teaching in most of the distance face-to-face teaching scenarios. Of course, exists other popular apps as Classroom Attendance Tracker, in G-suite, that offer a tool for schools to take student attendance when remote learning, an add-on to google sheets (https://workspace.google.com/marketplace/app/classroom_attendance_tracker/993028068285).

As we have shown in the introductory part, attendance at classes, in many cases, is necessary for students to achieve the skills or the competencies required by teachers through assessments and to adequately respond to the requirements of future jobs that they will get after graduation. The presence in the classroom was often done by building a list of full names and counting at the beginning of each hour the students in the classroom to check if their number to match the number of students on the list. This system avoids the loss of time when the teacher read aloud the catalogue every hour and check if students are present. Also, this system depends on the observation process that the teacher must do during the course hour in which him observe the students faces and their position in the classroom. The process is based on the fact that the position in the classroom did not change during the course hours, any change in this situation becoming a source for reiteration of the attendance list through the reading of the names from the class catalogue. In the online environment, however, the number of attendances is permanently displayed by the application but the faces cannot all fit on a monitor or if they fit, they are very small and not always of high video quality, depending of course on the devices used and the network's upload/download speed. Displaying all the time the participants names or making print-screen with the list of participants is again a problem. This is because when a student enters after making the print-screen of participants this procedure must be resumed and the teaching/evaluating process must be interrupted.

In the case of the Webex application, this software provides a usage report for each meeting from the last 3 months. The usage report generated by Webex application is shown in figure 1.

All sessions in Romania Time (Bucharest, GMT+02:00)																				
Session detail for 'Sistem de rapoarte generat de aplicatia Webex':																				
Participant	Audio Type	Name	Email	Date	Invited	Registered	Start time	End time	Duration	Company	Title	Phone Nui	Address 1	Address 2	City	State/Prov	Zip/Postal	Country/re	Network	
1	X Test	xtest.testx	3/5/2021	No	N/A	2:28 PM	3:17 PM	49 mins												External
2	VoIP	X Test	xtest.testx	3/5/2021			2:28 PM	3:16 PM	49 mins											
3	y Test	ytest.testy	3/5/2021	No	N/A	3:04 PM	3:16 PM	13 mins												External
4	VoIP	y Test	ytest.testy	3/5/2021			3:04 PM	3:16 PM	13 mins											
5	z Test	ztest.testz	3/5/2021	Yes	N/A	2:59 PM	3:16 PM	17 mins												External
6	VoIP	z Test	ztest.testz	3/5/2021			2:59 PM	3:16 PM	17 mins											

Figure 1. Activity Report Generated by Cisco Webex Online Software Opened With Microsoft Excel

In the report header we distinguish the name of the meeting, the time zone after which the time was noted in the table and then in an order the meeting participants. The rows with participants contain the participant name, email

address, time of login, time of disconnection and minutes counting the time between login time at the meeting and the moment of disconnection from the meeting.

This activity report file can be downloaded directly from the website uaic.webex.com by the teachers of the "Alexandru Ioan Cuza" University of Iasi, if they want to. They could download at least one file for each of the teaching/learning meetings organized with students.

SessionDetailReport20210307112051.csv - Notepad

File Edit Format View Help

"All sessions in Romania Time (Bucharest, GMT+02:00)"

"Session detail for 'Sistem de rapoarte generat de aplicatia Webex'"

Participant	audio type	name	email	Date	Invited	Registered	Start time	End time	Duration	Company title	Phone Number	Address 1	Address 2	City	State/Province	Zip/Postal Code	Country/region	Network	Joined from
1	x	xtest	xtest@test.ro	3/5/2021	No	N/A	2:28 pm 3:17 pm	49 mins						External					
2	WDP	x	xtest@test.ro	3/5/2021			2:28 pm 3:16 pm	49 mins						External					
3	y	ytest	ytest@test.ro	3/5/2021	No	N/A	3:04 pm 3:16 pm	13 mins						External					
4	WDP	y	ytest@test.ro	3/5/2021			3:04 pm 3:16 pm	13 mins						External					
5	z	ztest	ztest@test.ro	3/5/2021	Yes	N/A	2:59 pm 3:16 pm	17 mins						External					
6	WDP	z	ztest@test.ro	3/5/2021			2:59 pm 3:16 pm	17 mins						External					

Figure 2. Activity Report Generated by Webex Online Software Opened with Notepad

Starting from the information that the report provides and studying the structure of the CSV file (figure 2) that contains this report, but which they read in bytes, the authors built an algorithm who parse several such files and centralize the information in a presences catalogue for the virtual meetings of the students with their teachers.

3. The designed algorithm

The block diagram of the algorithm is represented in figure 3. It is mostly a linear algorithm who parses a single file and at the end if the teacher adds another file then the algorithm makes a repetition of the entire linear part, but adding the new information in the destination file, the presences catalogue. The simplicity of the entire software is a good thing but involves some limitations. One of them is that the source file must not be altered in any way, neither the name, nor the content. The authors have done some tests and discovered few modifications which are acceptable by the algorithm but they also strongly recommend at this point to not do any modification to the original Webex report. Also, it is a limitation regarding the delimiter symbol for field and for row. The software works with the "comma" symbol as delimiter of fields in a single row and with a specific byte's value as delimiter for each row.

The algorithm can be implemented in several ways, using databases to store information or using lists of files to integrate at any time upon request. Our working model is based on lists of files integrated on demand. Storing the files provided by the client would require more storage space than the authors had available for this project. Because of this they choose to rewrite the partial files and to delete the files already interpreted by the algorithm once the data is collected from them. At the same time, they mention that this software makes only a presence catalogue so that the student's presence can be more easily identified by the teacher for a longer period of time. For this reason, the authors strongly

recommend to the teacher to keep also the files generated from Webex software because they remain the evidence of the student's attendance at classes.

The working model the authors used combines some variables initialized by any server automatically when the client-server relationship is first established and concepts from object-oriented programming. For the correct manipulation of data, we have built a class who define objects with one single property and to whom we apply three methods. Those methods will manage the object's properties. That class includes a method of retrieving data from uploaded CSV files and, with that data, to populate the *fields* property. That class also includes two methods of generating content for the user's interface.

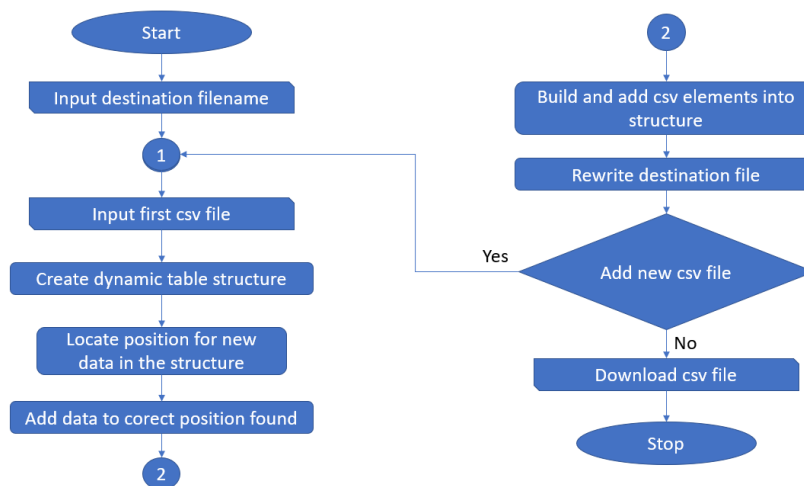


Figure 3. Software Block Scheme

File management verification is made with the help of SESSION variable. Because this is used in a work session is useful because it eliminates many of the situations when information is accidentally doubled or when same file is uploaded repeatedly. The file management section identify that a filename already exists in the SESSION variable that keep this information, means that was already uploaded and stop the parsing algorithm to gather again the data from that file. If doesn't identify the name as a duplicate than the algorithm writes the filename in that SESSION variable and then allow the parser to grab data.

The user interface includes a form for submitting a name for the resulting file and for uploading one of the source files. After the first source file was sent to the server the same interface will also include an area for accessing the results in two available formats: the CSV file for download when a link is clicked, and the web interface for displaying data in table style. The information shown in the user web interface will be increasingly developed as more source files are uploaded for the parser.

The application uses the PHP as writing language for backend part of the program and provides a simple client interface in HTML as writing language for frontend part. As we already mentioned the backend part of the application is built as a php class, made by ourselves. The *csv_builder* class has the following structure:

- the array type property named „fields”
- the methods:
 - „loadwebexcsv”
 - „t_show”
 - „build_csv”

Uploading any CSV file through the application interface to the server, after the name of the file is checked to avoid repetitions, allows the *loadwebexcsv* method to check if the file can be correctly parsed, to interpret the information in it by browsing and collecting useful data for the centralizer and to fill in the *fields* property with this information. At the same time, the name of the parsed file is added to the SESSION variable. As we mentioned already this variable is the one used to avoid repeated sending errors.

The information in the *fields* property is first structured after the values from the *E-mail* column (fig. 1). The first step in the algorithm evolution is to store the value from the *Name* column (fig. 1) corresponding to the e-mail value. Then the authors create an array structure with date information as key, and with the numerical values corresponding to the minutes of participation in each video meeting as value (fig. 1). For each new CSV file uploaded, the data stored in the *fields* property for any participant to video meeting are increased with the new date/time information.

Each time when the user interface is regenerate on the screen in the Internet browser window, on the right is shown an HTML tag as the reference to the CSV file generated using the *build_csv* method and ready for download. At the same time, the same information from the *fields* property, this time in HTML format generated with the *t_show* method, are also included in the user interface presented in the browser and could be checked by the teacher in any moment.

4. The results as CSV file

For the following example the authors used 3 CSV report files generated from the Webex application and downloaded locally. The contents of the newest of them is represented in figures 1 and 2. The contents of the other two source files are shown in figure 4.

Figure 4. The other two CSV files opened in Microsoft Excel

After the successive upload of source files using the file upload form, which is to be found in the first rows of the user web interface, the result is shown as HTML table (fig. 5). In the first row are the column headings which show the date of the meeting but in the order in which the files are uploaded. In the first column are arranged the names of the participants. They are shown in the order in which they are identified in the files. In the rest of the columns the user could identify in which days the participant was present at the online presentation and how many minutes has participated in the video meetings.

Participant	2/25/2021	3/3/2021	3/5/2021
y Test	34	33	13
X Test	58	48	49
h Test	45		
z Test	43	34	17
n Test	40	35	
m Test	56	31	

Figure 5. The result table

The user find also empty spaces in table. If the fields have no number of minutes inside, it means that the corresponding name on the horizontal row containing that field did not participate with the same email or did not participate at all at the video meeting in the corresponding day on the vertical column that contains that field.

In the user interface, at the top right is now the download button of the resulting CSV file. It contains enough elements to be viewed correctly in the version of Excel 2019 (fig. 6).

Centralizator prezenta			
Participant	25.2.2021	3.3.2021	5.3.2021
y Test	34	33	13
X Test	58	48	49
h Test	45		
z Test	43	34	17
n Test	40	35	
m Test	56	31	

Figure 6. The result CSV file opened with Excel 2019

5. The Conclusions

The utility of this application is generated by the output file which can be downloaded from the application interface for the attendance catalogue for several video meetings with over 150-200 participants each. In the described situation the manual centralization of the information from several files would be difficult. The ingenious realization of the algorithm is revealed especially by the easy usage, by the file's quick parsing method and by the speed in which the reports are generated in both tabular forms. The resulting file is in a simple CSV format that can be opened with any spreadsheet read application. For older versions of Excel applications, it is necessary to use configuration tools for the correct opening of the resulting files. On the Excel 2019 application, which the authors tested, the visualization of the content of the resulting file is done correctly.

The application was available at: dppd.psih.uaic.ro/apps.dppd/centralizator_prezenta/. It was the first version of the application and it is in the stage to be developed in the second version with a more friendly user interface which will include advanced elements for information's security. At the same time, the `csv_builder` class will be developed on request with new methods. The authors already think of two improvements: one to sort the columns by first row values (ascending after the calendar data) and one to sort the rows by the participant's names column. New information could be taken in the result file from the sources file. The authors could fill in the result tables with information such as video meeting name taken from the source CSV files if this name is the same in all uploaded files. Also, the authors could complete the resulting tables with one new column where to calculate the entire amount of minutes of participation or with the average amount of minutes of participation on total meetings or both.

The idea and the work for developing this application, all carried out voluntarily, belong to the authors of this article.

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