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Effective Supervision of Students' Activity During Classroom Learning and Testing

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Abstract

Due to the lockdowns caused by the COVID-19 pandemic, the majority of educational institutions worldwide have been forced to switch to online education, which has created a significant challenge for teachers and students alike. In order to communicate effectively in the online space, educational institutions had a wide range of tools to choose from (e.g. Adobe Connect, Cisco Webex, Google Meet, Microsoft Teams, Skype, Zoom, etc.). The challenge for teachers was to learn how to use them, to teach practical subjects effectively and to provide a supervised examination environment. The return to face-to-face (in-class) teaching after the end of the COVID-19 pandemic has allowed the online collaborative environments listed above to fade into the background, but the supervision of interactive, computer-based practical lessons (e.g. teaching programming languages, network programming etc.) and proctored examinations can still be a challenge for teachers. This article reviews some screen monitoring systems developed for both corporate and educational environments. We present one of them in more detail, namely Veyon, which is available free of charge[1] and can be used on different operating systems, and whose applicability in both teaching and examination has been tested for almost a year at the Faculty of Informatics of the University of Debrecen.

Keywords: Classroom Management Software (CMS), digital learning, remote control, safe examination, screen monitoring, Veyon

1 Introduction

In the wake of COVID-19 pandemic, the world has seen a drastic transformation in how students learn and how teachers teach. As social distancing measures have forced students and educators alike to stay at home, digital learning has become the new norm. With this shift to online learning, classroom management software

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[1]The basic version of Veyon is free, but you have to pay for the various desired add-on licenses.

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(CMS) has become an essential tool for teachers to increase the efficiency of in-class learning and teaching. This paper discusses how, returning to the in-class teaching, CMS can improve the digital learning experience, keep students engaged, ensure interactive communication, track completion of practical tasks, and increase the safety and security of exams, sharing our experiences at the Faculty of Informatics of the University of Debrecen.

One of the key benefits of CMS is its ability to keep students interested in the learning experience. Traditional online classroom sessions can become monotonous and unengaging, leading students to become bored and disinterested. However, CMS allows teachers to incorporate interactive elements into their lessons, such as quizzes, games, and polls, to keep students engaged and motivated. Moreover, CMS can also ensure interactive communication between teachers and students. With chat boxes, they can communicate in real-time, providing opportunities for students to ask questions and teachers to provide feedback. This interactive communication not only fosters a supportive learning environment but also ensures that students are engaged in their learning and receive personalized attention from their teachers.

Another critical feature of CMS is its ability to track the completion of practical tasks, such as programming assignments. Tracking student progress in real-time can help teachers to identify areas where students may be struggling, allowing them to provide personalized support when necessary. Furthermore, it allows teachers to monitor students' progress, which can help them to adjust their instructional approach to cater to the needs of individual students more efficiently. CMS also enables restrictions on the use of permitted software and websites.

This feature is particularly useful in ensuring that students remain focused on the educational material during class time, reducing the likelihood of them becoming distracted by social media or other non-educational websites. CMS can also provide a reliable test and exam environment. With remote control and screen monitoring functionalities, teachers can ensure students' compliance with exam rules and minimize the risk of academic fraud. Additionally, these features provide a secure environment for students to take exams, ensuring fair and equal opportunities for all students.

2 Increasing the efficiency of in-class education using management software tools

Based on our previous experience in online education, we have tried to find online tools that can effectively address the problems and challenges listed in the Section 1. In the first instance, we looked online for solutions that could make in-class teaching more effective by providing the features enumerated in Table 1.

Seventeen relevant software products were found that could meet all or part of the needs we listed. Some of these are commonly used in corporate environments to monitor employees' online activities (Employee Monitoring Software – EMS), others are specifically developed for in-class educational supervision (CMS). Table 2 summarises the main characteristics of the 17 solutions we examined, such as which

Table 1: CMS key features and benefits [11]

Screen monitoring	When additional support or guided learning is needed, teachers can quickly view every student monitor in real time — or switch to view individual screens.
Remote control	Make the most of class time by remotely logging in to one or more student devices to install apps or updates while students continue to work.
Broadcast teacher screen	Increase engagement in the classroom by broadcasting one screen to student monitors. Full-screen view locks student devices, and windowed view lets them work along with the teacher.
Push website	Save precious class time by instantly launching the same website on every classroom device to ensure students are always on task, focused and ready to learn.
Launch app	Get even more from class time by troubleshooting navigation issues and launching the same application on selected student devices — or for the entire class.
Blank screen	With the touch of a button, educators can shift classroom attention to them by blanking student screens and locking their devices.
Snapshot	Quickly take screenshots to showcase exceptional student work in the classroom, which may even be used as evidence later.
Send/receive files	Send documents, reading assignments, templates and other materials to student devices. Digitally collect assignments when they're complete.
Messaging	Simplify classroom communication, increase engagement and redirect focus with messaging features. Receive students' questions and chat one-on-one or with the entire class.
Remote power on/off	Remotely power on or off student devices to redirect focus or to perform app updates and other maintenance.

operating systems the environment can be installed on, whether it is available on a web interface, and whether the service is free or paid. All in all, we chose Veyon because it had all the features we needed, could be installed on both Windows and Linux operating systems, and last but not least, was free of charge (see e.g. [23, 7, 22, 2, 13]). At the same time we searched the internet for the most recommended

CMS system for 2023. A possible ranking is available on the website below: https://www.g2.com/categories/classroom-management#grid.

Surprisingly, the Veyon we have chosen is not in the ranking list, as if it were a completely new and unknown solution. As it has performed well in our university during the last year of live testing, we decided to present its use to the teaching community in this paper.

2.1 Installing Veyon

Installing Veyon is very simple. You need to use the installer downloaded from the official website (see [23]) for both the instructor and student installations, with the following settings:

The three components (*Veyon Service*, *Veyon Master*, *Interception driver*) must be installed on the teachers' computer. After installation, the necessary system settings can be made in the *Veyon Configurator*. Under the *General* menu, the *Key file authentication* option must be selected as the authentication method, and then under *Authentication keys*, the key pair for authentication must be created. The private key will be used on the instructor machine, whereas a public key needs to be exported to the student computers. Then, under *Loction & computers*, we can create the rooms and specify the names and IP addresses of the machines per room. If we want to save the current settings or load a previous backup, we have the option to do so in the Veyon Configurator's *File* menu (*Load settings from file*, *Save settings to file*). Veyon stores the settings in JSON format files.

On the students' computers, the *Veyon Master* system component does not need to be installed (only the *Veyon Service* and *Interception diver* components should be installed). Under the *General* menu, the *Key file authentication* method must be selected as authentication method, as for the teacher's computer. Then, under the *Authentication keys* menu, we need to import the public authentication key exported from the teacher's computer in the previous step (this can be done either using a pendrive, a network shared directory or an FTP server). If we need the IP address of the local machine (e.g. to register it to the teacher's machine), we can do this by issuing the *ipconfig* command in Command Prompt in Windows operating system, or in a Linux environment using the *ifconfig* or *ip addr show dev [interface name]* commands.

2.2 Veyon in action

Veyon is the only open-source CMS available on the market at the moment. Previous versions were called iTalc but it has been completely rebranded a few years ago. They had given up development on iTalc and then for some reason now they have rebranded and started issuing new releases [12].

The current version of Veyon includes the following features, which are typically accessed through the main menu: Monitoring, Demo, Lock, Remote view, Remote control, Power on, Reboot, Power down, Log in, Log off, Text message, Start application, Open website, File transfer, Screenshot.

Table 2: EMS and CMS comparison

Software list	Type	Supported operating system						Availability		
										
AB Tutor [1]	CMS	✓	✗	✓	✗	✗	✗	✗	✓	Non-free
Dyknow [3]	CMS	✓	✗	✓	✓	✗	✗	✗	✓	Non-free
Employee Desktop Live Viewer [4]	EMS	✓	✗	✗	✗	✗	✗	✗	✓	Non-free
Epoptes [5]	CMS	✗	✓	✗	✗	✗	✗	✗	✗	**Free**
Faronics Insight [6]	CMS	✓	✗	✓	✓	✓	✓	✗	✓	Non-free
Impero Classroom Management Software [8]	CMS	✗	✗	✗	✗	✗	✗	✓	✓	Non-free
LanSchool Classic [10]	CMS	✓	✗	✗	✗	✗	✗	✗	✓	Non-free
LanSchool Air [9]	CMS	✗	✗	✗	✗	✗	✗	✓	✓	Non-free
Mythware Classroom Management Software [14]	CMS	✓	✓	✓	✓	✓	✓	✗	✓	Non-free
Net Monitor for Employees Professional [15]	EMS	✓	✓	✓	✗	✓	✓	✗	✓	Non-free
Netop Vision [16]	CMS	✓	✗	✓	✓	✗	✗	✗	✓	Non-free
NetSupport School [17]	CMS	✓	✓	✓	✗	✓	✓	✗	✓	Non-free
Quasar [18]	EMS	✓	✗	✗	✗	✗	✗	✗	✗	**Free**
SchoolVue Classroom Management [19]	CMS	✓	✓	✓	✓	✓	✓	✗	✓	Non-free
ScreenWatch [20]	CMS	✓	✓	✓	✓	✓	✗	✗	✓	Non-free
SurveilStar Employee Software [21]	EMS	✓	✗	✗	✗	✓	✗	✗	✓	Non-free
Veyon [23]	CMS	✓	✓	✗	✗	✗	✗	✗	✗	**Free**

The use of Veyon is explained in the administrator and user manuals available in several languages on the official website, as well as in several youtube videos to help the user community.

3 Experiences with Veyon

We started using Veyon in education at the Faculty of Informatics of the University of Debrecen in autumn 2022. As the academic year is slowly approaching, we would like to share some our positive experiences of using it. The installation of the system can be described as simple (see Section 2.1), although it is a two-man job for larger computer rooms. We have used it to monitor an average of 18-25 machines per room. The system is stable, and in almost a year of intensive use, we have not experienced any operational problems, and it has worked practically as expected. We can say from our experience that it has been a great help in teaching the practical lessons of Programming Languages, in monitoring the students' activities, in making the best use of the lessons, in writing the weekly tests, clearly contributing to the quality of teaching. Figure 1 shows a 16-machine supervision system. While writing a Cisco class test, one of the students wanted to watch a video. Figure 2 shows the use of a calculator during a test writing session. The timestamp on the Veyon screenshots comes in handy.

As regards the evolution of student performance, two groups were selected for the same class as an experiment. In the case of both groups, the number of students was 18. In one group we did not use Veyon, while in the other we introduced it. As shown in Figure 3, the latter group showed some deterioration in performance over the semester. While in the first case the students' scores on the online tests averaged above 90%, when using Veyon they fluctuated between 80 and 90%. Given that the minimum performance required to obtain most industry certificates is 70%, it can be said that students performed well using Veyon, and not least as an indication of their true level of knowledge.

4 Conclusion

In this paper we have presented the possibilities of using CMSs in education. Out of seventeen CMS and EMS, we finally chose Veyon because, despite being free of charge, it includes all the relevant features needed for tutor supervision. After nearly a year of live testing, we concluded that its stable operation makes it a safe choice for practical class supervision. The use of Veyon does not cause any significant deterioration in student performance, increases the quality of teaching of practical classes and facilitates the correctness of the assessment. Although Veyon itself cannot be used for video recording, the possibility of screen recording and the nature of the monitoring system make it worthwhile to inform students about the monitoring system used in the syllabus at the beginning of the semester.

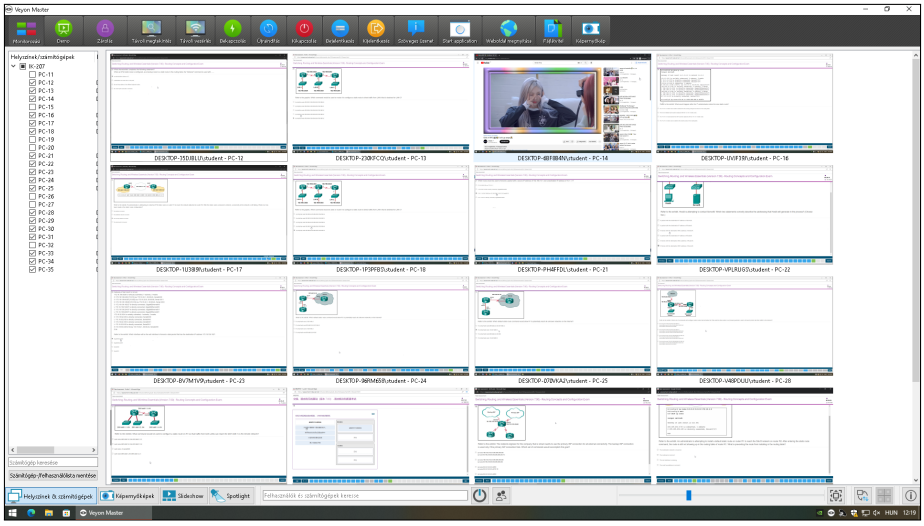

Figure 1: Veyon-supervised testing environment.

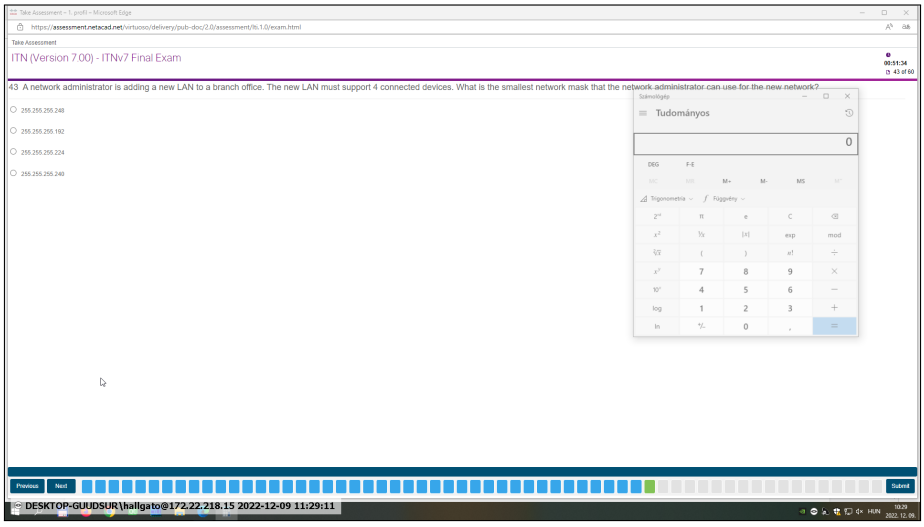

Figure 2: Monotoring a student screen with Veyon.

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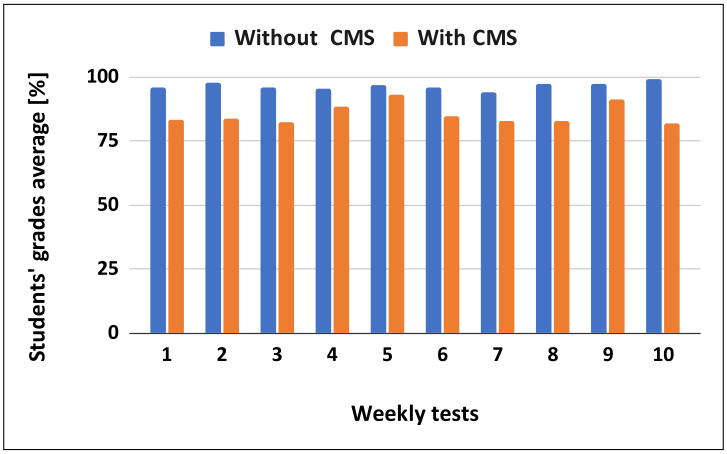

Figure 3: Comparing student's one semester performance with and without Veyon CMS in case of Cisco classes.

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