

# Online versus On-site e-Assessment in Medical Education: are we ready for the change?

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**Abstract**—We compared two E-assessment platforms and we evaluated the impact of online versus on-site examination by analysing students' outcomes and classifying them into performance groups. Two groups of 480 (G1/2019) and 527 (G2/2020) 2<sup>nd</sup> year medical students were included. G1 was assessed by using E-School Exam Module on-site, while G2 used FlexiQuiz assessment platform online. G2 received 3 partial examinations during the semester while G1 was evaluated by a single final exam at the end of the semester. Students were classified in four performance categories as high (8-10, HPG), medium (6-7.99, MPG), low (5-5.99, LPG) and fail (less than 4, FPG) based on final grade. The analysis was applied for both theoretical and practical exams. A significant increase of HPG (79% vs 4% for theory and 42% vs 16% for practice) was noted for G2 compared with G1. MPG remained relatively the same between groups while LPG decreased for G2 compared with G1 (22% vs 1% for theory, 25% vs 4% for practice). The G2-FPG significantly decreased but remained higher for practical exam. HPG, LPG, FPG were strongly influenced by applying different assessment methods while MPG remained similar for G1 and G2. Factors influencing these variations will be discussed here.

**Keywords** - online education, online assessment, e-Learning, e-Assessment, COVID 19 pandemic

## I. INTRODUCTION

The current context of the COVID 19 pandemic pushed worldwide universities through a radically change of teaching and evaluation methods by applying the online education methods exclusively [1]. This was a big challenge for both students and teacher [2,3]. The impact of such an abrupt transition from the traditional to the online education system cannot be quantified in terms of the quality of teaching and assessment yet [4]. Few universities from Romania (especially technical ones) had a well-developed infrastructure able to sustain a fully online teaching and assessment. Such e-learning platforms have been developed and used mainly in technical Romanian universities. Medical universities have an extremely low developed e-Learning and online assessment facilities, and the use of e-Learning platforms was limited to few disciplines [5]. Moreover, there are few medical universities in Romania which have specialized department for medical education, digital learning, or online assessment. Based on these facts, the transition from a classical to a fully online teaching and evaluation system took the teachers by surprise and forced them to adapt along the way by implementing learning and assessment methods that were not specific to medical education but were recognized as online communication

tools. There are several digital platforms which give us the opportunities to share lectures and seminars with our students but, in medical education, some disciplines need more specific and accurate methods to teach. If, for the lectures the most common and comfortable platform used by professors was ZOOM, for the practical labs there was a huge diversity of online tools but some of them were not standardized for a specific discipline.

Histology is a mandatory discipline for the second year of undergraduate medical studies, which need specific tools as microscopes and slides. Fortunately, since 2017, Department of Histology from Victor Babes University of Medicine and Pharmacy Timisoara, Romania implemented E-School platform, a computer-based teaching and evaluation system. E-School teaching module (Case Center) contains about 1500 scanned slides library used during online and on-site teaching classes and by students anywhere, anytime when they would like to review the items [5]. Case Center may be accessed and used both within and outside the university and, thanks to this facility during COVID 19 pandemic it was the main tool for distance learning and teaching practical labs in histology. Because of security reasons, E-School Exam Module has been set to be used only inside the university and thus, we were not able to use it for student's online assessment during COVID 19 pandemic. Thus, we are forced to find another online assessment platform helping us for distance evaluation imposed by the temporary inability to bring students to the university.

The main criterion for choosing another online examination platform was that the new platform to be as similar as possible to Exam Module we have used in the last 3 years. A secondary criterion but as a similar importance as the former was that the online assessment platform to allow us to attach high-resolution images without which the practical examination of histology would not have been possible.

There is several exam software in the world (about 70 of them being widely used in the academic world, [6]) but few are proper for histology practical examinations. Moreover, most of them may be with subscription per year with prices that sometimes are too expensive and are paid per student not per software.

Online examination remains a questionable issue even for those universities which have a huge experience with such evaluation methods and its impact is perceived differently by students [7,8].

We aim to compare two computer-based examinations platforms, one used on-site in the last 3 years to our discipline (E-School Exam Module) and another one used exclusively online during distance online assessment imposed by COVID 19 pandemic in terms of the variability of students' performance groups.

## II. METHODS

Two groups of 480 (G1,2019 group) and 527 (G2,2020 group) 2<sup>nd</sup> year medical students were included in the present study. For G1 we used as teaching tools on-site classical system to share the lectures. Practical labs were based on E-School teaching module (Case Center) [5]. The final assessment given once at the end of the semester for G1, was performed by using our own E-School Exam Module (3DHistech, Budapest, Hungary) and the exam was done on-site, within the university.

Due to the constraints imposed by the COVID 19 crisis which led to an exclusively online support of all lectures and practical labs, G2 received the lectures through online ZOOM videoconference platform and practical labs were performed in a similar manner by using the same E-School teaching module (Case Center) as for G1 but in this case combined with ZOOM videoconference platform.

For the assessment of theoretical knowledge, students from G2 were examined by using FlexiQuiz online assessment platform [9] at which temporary we subscription because our own online examination platform is not allowed to be used outside the university in this moment. The knowledge assessment for G2 was performed differently from G1 and consisted of 3 examinations during the semester (usually conducted after 3 or 4 lectures) and a final examination that combined the use of FlexiQuiz platform followed by ZOOM based videoconference short oral assessment. Both G1 and G2 students were classified in four performance categories as high (8-10, HPG), medium (6-7.99, MPG), low (5-5.99, LPG) and fail (less than 4, FPG) based on the final grade. Results analysis was applied for both theoretical and practical exams. For both evaluations we used multiple choice questions-based system, those for practical exam having attached images from histological slides. We applied a similar grading system for both Exam Module and FlexiQuiz examination platforms. Time given to G2 students was increased compared to G1 due to inability of managing internet connections and subsequently delayed uploading of images on FlexiQuiz platform.

## III. RESULTS

No significant differences have been observed between on-site teaching process (applied for G1 in 2019) compared with online one (used for G2 in 2020). The distance online teaching process was relatively homogeneous because all professors from Histology Department used the same tools for sharing lectures and practical labs.

Both G1 and G2 students assessment used a computer-based methods but the differences in between them were that G1 students performed examination within university by using well standardized and secured devices while G2 students were connected for assessment from their own homes by using their own devices highly heterogeneous in terms of performance. Due to these issues, for G2 the examination times was longer with about 15 minutes compared to the examination time allocated for on-site assessment. Significant

differences have been observed between G1 and G2 regarding the student's percentage from each performance group. Comparative distribution of G1 and G2 students among performance groups for theoretical exam may be observed in Figure 1.

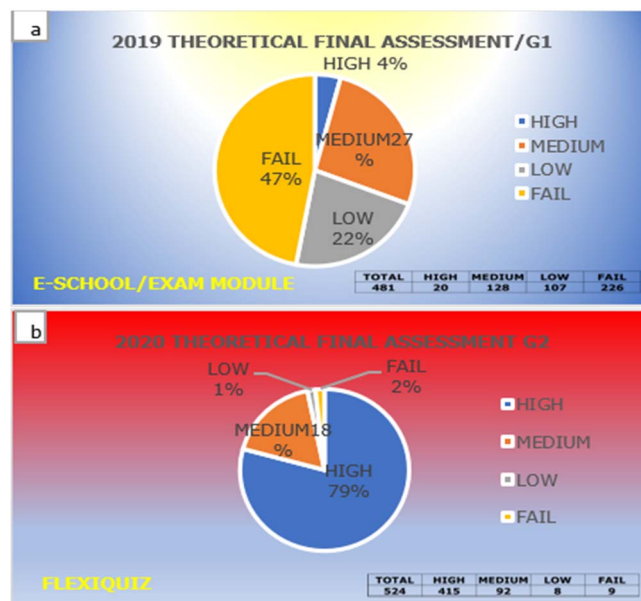


Figure 1. Students percentage related to performance groups for on-site (a) versus online (b) theoretical examination. Note that there are big differences between HPG (noted with HIGH on the graphic), LPG and FPG (noted with LOW and FAIL, respectively) from G1 and G2 but MPG (MEDIUM) remained relatively similar in between two groups.

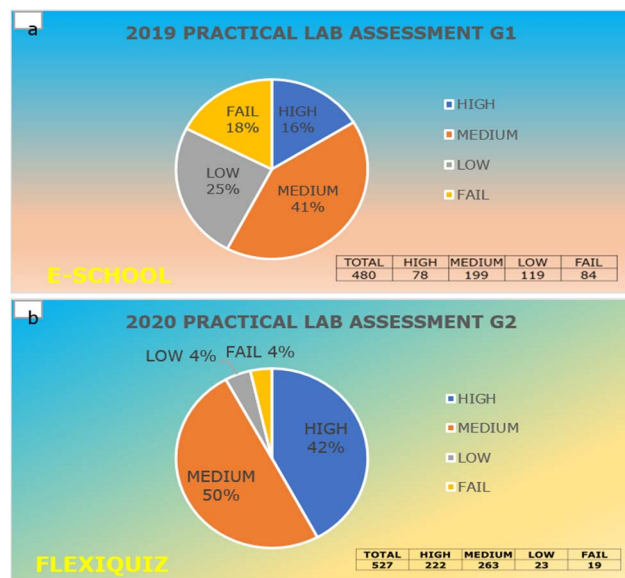


Figure 2. Performance group distribution based on the results obtained for practical lab assessment. Note the close percentage for MPG in G1 and G2.

The HPG percentage for theoretical assessment increased with 19.75 times for G2 compared with G1. This seems to be an unusual increase of performance influencing by various factors which will be discussed later. Also, FPG percentage drastically decreased from G1 to G2 group as also LPG.

Similar comparison was performed between G1 and G2 for practical lab assessment (Figure 2). The student's percentage included in HPG increased 2.65 times for G2 compared with G1, while MPG remained relatively similar between groups (41% for G1 versus 50% for G2). Also, FPG

was about 6 times lower and LPG registered a similar decrease for G2 compared with G1.

We also analysed performance group distribution among all 4 online module evaluations applied to G2 during whole second semester.

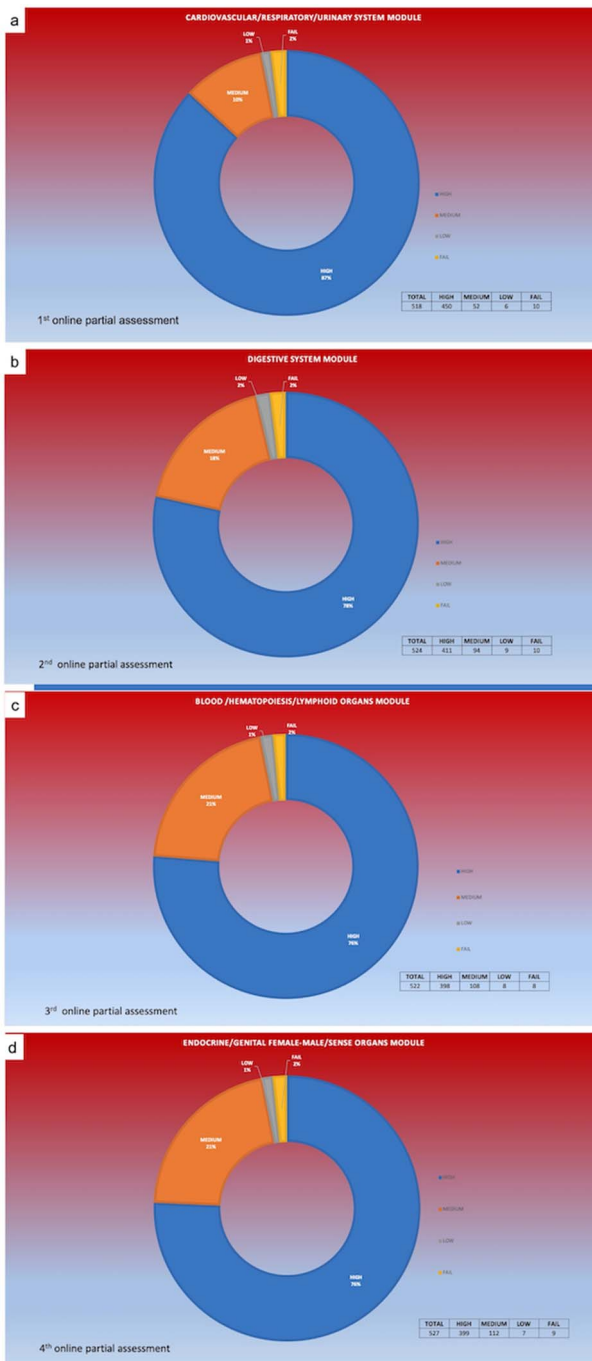


Figure 3. Modular examination showed a homogeneous distribution among performance groups. During progression of the modular evaluation MPG was 2 times higher for the last online evaluation (d) compared with the first one (a). LPG and FPG remained constant. HPG showed a slight decrease from the first to the fourth online evaluation.

Percentual distribution among performance groups are summarized in Table 1.

Table 1. Group performance percentage on-site vs online evaluation.

| Performance groups          | HPG | MPG | LPG | FPG |
|-----------------------------|-----|-----|-----|-----|
| On-site/online assessment   |     |     |     |     |
| 2019/G1/ Theoretical exam   | 4%  | 27% | 22% | 47% |
| 2020/G2/ Theoretical exam   | 79% | 18% | 1%  | 2%  |
| 2019/G1/ Practical lab exam | 16% | 41% | 25% | 18% |
| 2020/G2/ Practical lab exam | 42% | 50% | 4%  | 4%  |

#### IV. DISCUSSIONS

*To do or not to do remotely online students' assessment? This is the question!* Not just a question but a huge challenge for medical education in Romania. If Shakespeare had lived through this period of pandemic that launched so many challenges to the medical international academic world, he would certainly have been in a great dilemma.

Most Romanian medical universities were not prepared for online teaching, learning and students' evaluations. Thus, during COVID 19 crisis, most of them made several efforts to continue academic year by switching from a classical on-site lectures and seminars through a fully online teaching method. For preclinical years such a change was easier to implement but, for clinical subjects this switch was exceedingly difficult especially because of the absence of on-site clinical seminars.

Unexpectedly, even the world's prestigious medical universities were taken by surprise by this pandemic despite the fact that they had implemented and used the online supervised examination system but inside the university several years ago for both preclinical and clinical subjects.

For several top universities from UK for example, this was the first year when medical students have taken unsupervised exams from home [10]. Such a so called 'open book' exam delivered remotely was also implemented to our discipline as an emergency measure caused by COVID 19 pandemic, despite of the fact that we used digital exams for about 3 years but only by a supervised on-site procedure.

This was our first experience with remotely online examinations in histology and several issues arises from this experience. A comparison between results obtained by students in 2019 (when we used Exam Module on-site, supervised) and those from 2020 showed us an exponential increase of students who were included in HPG (having marks between 8-10) for theoretical exam. These results may be explained in part by the implementation of 4 partial examinations performed during semester, each of them including no more than 4 lectures to be assessed. This method kept students continuously connected to study of histology and stimulate them for a continuing study of the subject to participate to these partial evaluations. In this way, for the final exam they had few lectures to prepare and it was easier for them. Another issue which it must be discussed is the time allocated for each exam book. Usually, for on-site examination the students received 65 seconds/question according with the rules of the university. Because we were not able to manage the internet connection of each student and also because of the use of high-resolution images for practical exam (which sometimes had a delayed uploading for

some students) we were forced to give students more time per question (120 second/question). For some students giving more time per question would be a favouring factor for cheating giving the fact that we were not able to supervise all students by videoconference or other similar. Cheating is not specific for our students being reported worldwide [11, 12] Other universities tried to find different methods to stop cheating: giving less time/question, monitoring each student by using a video-based platform, increase the complexity of the questions or to test their observational skills. Thus, we consider adding for the final examination a videoconference based quick oral examination also. When the students know that it follows a brief oral examination also, they are stimulated to truly learn by reading lectures not by being busy to find different cheating methods.

Although HPG was predominant for theoretical exam in G2 group, its value was significantly lower for practical lab exam for the same students' group. Practical lab is giving to students to develop specific skills for their future clinical practice. Practical exam is given to test students observational skills based on the recognition of different tissue and based on their ability to make correlations of theoretical information with a visual pattern specific for each structure. Despite of a more time given to students for remotely online evaluation, not so many students have observational skills fully developed to obtained higher marks which classify them into HPG group. Thus, MPG group predominated for practical exam in both G1 and G2 groups.

We have used minimal IT and anti-fraud measures, but in the future, they will have to be introduced into the strategy and implemented advanced solutions offered by the progress of technology in this field.

Commercially available platforms for remotely online assessment are useful tools for teachers when on-site examination is not possible, or this is not allowed due to independently reasons. The big advantage is that they exist and may be usable. One of the big disadvantages is that they are not free for academic staff or it is not possible to buy it for long time use without any other extra-costs. Most of them may be with subscription for a limited time or with a huge cost/student /each evaluation. Thus, universities, especially those with a limited budget avoided to implement them before without having a strong reason to do this. Another disadvantage is that, after it is used, and the payment stops all students' results may be missed if they are not saved on an external device (or several given the fact that there are hundreds of students who may have up to 3 examinations/year).

There is few available online exam software to buy once and to use it for unlimited timespan or number of students. This software is more comfortable for the universities because they may be managed by the IT staff of the university who has own control on it. Students data may be stored and found on such a platform anytime you need.

## V. CONCLUSIONS

Remotely online examinations represent the unique way to continue the educational process during academic year in special situations as that we live now. Commercially available assessment platforms are useful for a limited time and do not give us all criteria for an objective evaluation of the students. Implementation of own assessment platform by each

university seems to be the best choice for both teachers and students.

The crisis strategy chosen to maintain a constant pace of learning was to increase the number of partial evaluations, which contributed to the involvement of students in the learning and examination process, at the same time this proactive measure largely replaced contact directly with which we are accustomed on-site. Based on this strategy, students performance will increase. A digital learning and examination platform is useful for on-site online educational process, but its usage on remotely online assessment becomes a stringent need imposed by crisis situations, when the learning and examination activity must have continuity and must have advanced technology available to teachers and students alike. For online education, when using examination facilities for students, computer security and anti-fraud measures should not be ignored in order to prevent negative events that may occur in this way of working.

We may consider that we are on a good way but the most accurate and objective remotely online students assessment may be done only after the whole infrastructure for this evaluation type will be developed and by creating and implementing clear rules to apply it.

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## REFERENCES

- [1] <https://www.natureindex.com/news-blog/forced-shift-to-online-teaching-in-coronavirus-pandemic-unleashes-educators-deepest-job-fears>
- [2] Houston, D., Meyer, L. H., & Paewai, S. (2006). Academic staff workloads and job satisfaction: expectations and values in academe. *Journal of Higher Education Policy and Management*, 28(1), 17–30.
- [3] Houlden, S., & Veletsianos, G. (2020). Coronavirus pushes universities to switch to online classes – but are they ready?. <https://theconversation.com/coronaviruspushes-universities-to-switch-to-online-classes-but-arethey-ready-132728>
- [4] <https://www.insidehighered.com/digital-learning/article/2020/03/18/most-teaching-going-remote-will-help-or-hurt-online-learning>
- [5] Cosnita, R. M., Cimpean, A. M., Raica, M. (2020). E- Learning and E-Assessment: Two Big Challenges of Medical Education Management in Romania. *Mednarodno inovativno poslovanje = Journal of Innovative Business and Management*, 12(1), 61-71. DOI: 10.32015/JIBM/2020-12-1-8
- [6] <https://www.capterra.com/exam-software/>
- [7] Walsh K. Online assessment in medical education-current trends and future directions. *Malawi Med J.* 2015 Jun;27(2):71-2. doi: 10.4314/mmj.v27i2.8. PMID: 26405516; PMCID: PMC4562084.
- [8] Choi B, Jegatheeswaran L, Minocha A, Alhilani M, Nakhoul M, Mutengesha E. The impact of the COVID-19 pandemic on final year medical students in the United Kingdom: a national survey. *BMC Med Educ.* 2020 Jun 29;20(1):206. doi: 10.1186/s12909-020-02117-1. PMID: 32600460; PMCID: PMC7323883.
- [9] <https://www.FlexiQuiz.com/Home/Index>
- [10] <https://www.theguardian.com/education/2020/mar/22/coronavirus-forces-medical-students-sit-final-exams-online>
- [11] Backman J.: Students' experiences of cheating in the online exam environment. phdthesis, Laurea University of Applied Sciences (2019)
- [12] Watson, G., & Sottile, J. (2010). Cheating in the Digital Age: Do students cheat more in onlinecourses?. *Online Journal of Distance Learning Administration*, 13(1)