Covid-19, an opportunity to compare in-person and online teaching

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Abstract: The dichotomy between traditional in-person teaching versus online instruction has been discussed for years. The lockdown, consequence of the Covid-19 pandemic, gave us an opportunity to gain evidence and compare in-person versus online teaching by the same professor, in the same subject, and by the same students which is an interesting scenario because the only variable is the teaching setup. Here, we surveyed students that following a traditional in-person subject were abruptly compelled to continue it online. We summarize the students' responses when asked to compare both types of teaching with the singularity that the rest of the variables were kept constant. Finally, we compared the grades of this "hybrid taught" group of students with the grades from groups of previous years in the same subject, by the same instructor, but totally in-person. We, as medical teachers, were excited about the possibility that the online teaching forced by the Covid-19 pandemic will develop in the system for delivering our lectures in the near future. Even considering that grades were not affected and pros such as comfort and participation, according to our study, students prefer in-person education mainly because of the direct contact and interaction with peers and teachers.

Keywords: online teaching; medicine teaching; synchronous teaching; medical education

1. Introduction

Learning by attending lectures from a teacher is as old as the human civilization; in fact, storytelling is considered as one of the differential elements that permitted Homo sapiens to prevail over the other species (1). Time has passed but we still rely on gathering for receiving and transmitting knowledge. Technology has also evolved, providing the tools to deliver lectures without the necessity of wasting time in commuting, among many other aspects. Online lectures emerged as an interesting opportunity and nurtured the field for a polarized discussion that opposes classical in-person lectures and online instruction, both sides with strong supporters.

Online instruction integrates different entities: on one end of the online spectrum, those in which all content was previously generated, made available for attendants, contact with a teacher is occasional and grading is produced; on the other end, synchronous lectures in which the students can interact with the lecturer through some of the many available video conference systems at the same time but in different locations (2, 3). To delimitate the span of this work and to make it clearer for the readers from the beginning, in our analysis, we refer only to synchronous online teaching.

The process of obtaining scientific evidence to compare and make decisions to improve teaching is hampered by several methodological issues that turn this task into a very challenging one. Only the sum of experiences and attempts, along with the use of different approaches with different flabbiness's, could produce stronger evidence. Here are some examples that illustrate these experimental difficulties. Brockfeld and cols. split the students into groups and, consequently, an extra variable (the particular student) was included (4). They concluded that video and live lectures are equally effective for medical exams. The same was concluded in a similar setting by many others (5-9). Alternatively, there is evidence for slightly better performance for in-person students (10-13). We have only mentioned some of an endless list of references; however, a somehow general conclusion is that online teaching is not worse in terms of academic performance (3); consequently, its advantages, such as time and cost reduction, deserve to be considered. It is interesting to finish this idea with a reference pointing out how to turn the difficulties into positive elements in the online teaching (14).

Apart from the academic considerations mentioned before, a lot has been written about the students' perception, opinion, and preference between online or in-person university education. Without being exhaustive, some authors (10) found students in favor of online videos, whereas others (4, 15, 16) found students inclined to in-person teaching.

In this work, we took advantage of the unusual situation of a course delivered half online, half in-person to, through an anonymous voluntary survey, ask the students' opinion about different aspects regarding online versus in-person teaching. The distinctive aspect of this study relies on the fact that all the students participated in both online and in-person systems and that the instructors were the same, reducing interferences coming for different groups of students or instructors. The final goal of this study is to add a piece of evidence to the discussion between online and in-person teaching.

2. Methods

2.1 Context and participants

Students enrolled in the subject of Blood Physiology and Immune System (second year, second semester) of the medical degree provided by the Universitat Internacional de Catalunya (Barcelona, Spain) that were compelled to change from in-person towards synchronous online instruction. The subject, besides other activities, includes 16 lectures (2 h each) by the same instructor, 7 of which were delivered in-person, whereas the remaining 9 were synchronously delivered online. Students were informed during the last online session about the survey initiative and its voluntary and anonymous character. Both lectures and the survey were conducted in Spanish. The total number of students attending the course was 97 and the total responses were 51 (52.58%). The number of students in previous years was always 100 ± 10.

2.2 Online lectures

Online lectures were delivered synchronously (at the same schedule as originally programmed for the in-person) using the Blackboard Collaborate (BC) included in Moodle, which is the platform normally used by our University for students management. The sessions were recorded and available for the students through the Moodle platform.

2.3 Survey questions

The survey took place at the end of the course (May 2020). It was performed using Google Forms, including 9 closed questions where the participant was asked to assess from 1 (totally against) to 5 (totally agree), and an open question for comments The questions included in the survey are listed in Supplemental Table 1. Additionally, we included an open question for comments that was used for the qualitative analysis.

2.4 Exams

The exams were always composed of 50 multi-choice questions (4 options and only 1 correct) and the questions were always new. The difficulty of the exams was always considered including constant percentages of easy, medium, and difficult questions. In the case of the years before academic year 2019-20, the exam was in-person; in the case of the academic year 2019-20, the exam was online and monitored using the Smowl proctoring system (after formal agreement by the students).

2.5 Statistical analysis

For assessing normality in the data distribution we used Shapiro-Wilk test, considering both the p value ($p<0.001$), histogram and Q-Q plot graphical analysis. The grades were compared using the non-parametric Mann-Whitney test, $p<0.01$ was considered significant. Data are expressed as the mean and standard deviation.

3. Results

3.1 Students' perception about the use of Blackboard Collaborate (BC)

Before implementing BC, alternative solutions were pondered and discussed by the instructors including video-recorded sessions, use of forums for driving the self-learning process, and provide with materials (internet videos, specific websites from research groups, slide presentations produced by the professor, original research articles). Most of the students (43 out of 51) totally agreed and 7 students agreed with the use of BC as a good solution for continuing with the course during the lockdown.

3.2 Comparison between online and in-person teaching

Survey questions were grouped into four categories: practical aspects, session development, objectives achievement, and future teaching.

The results regarding questions about practical aspects are shown in Figure 1A. *Which type of lecture was easier to follow?* and *Which type of session was more physically comfortable?* reached a value of 3.11±1.21 and 3.39±1.28, respectively (1, totally disagree to 5, totally agree).

In the session's development, questions were about *the lecture's fluidity* and the *student's participation*. Results are shown in Figure 1B. The mean for fluidity was 3.41±1.22. For participation, it was 2.84±1.33.

In figure 1C, the questions were related to *educational achievement* and the *expected academic result*. The mean for achievement was 2.59±1.08 and for the expected impact on the academic grades, 2.24±0.98.

Finally, the questions oriented towards the future. We asked whether *online should take over in-person classes*, the mean was 1.67±0.99. When we asked about their *inclination for receiving more online teaching in the future*, the result was 2.24±1.30 (Figure 1D).
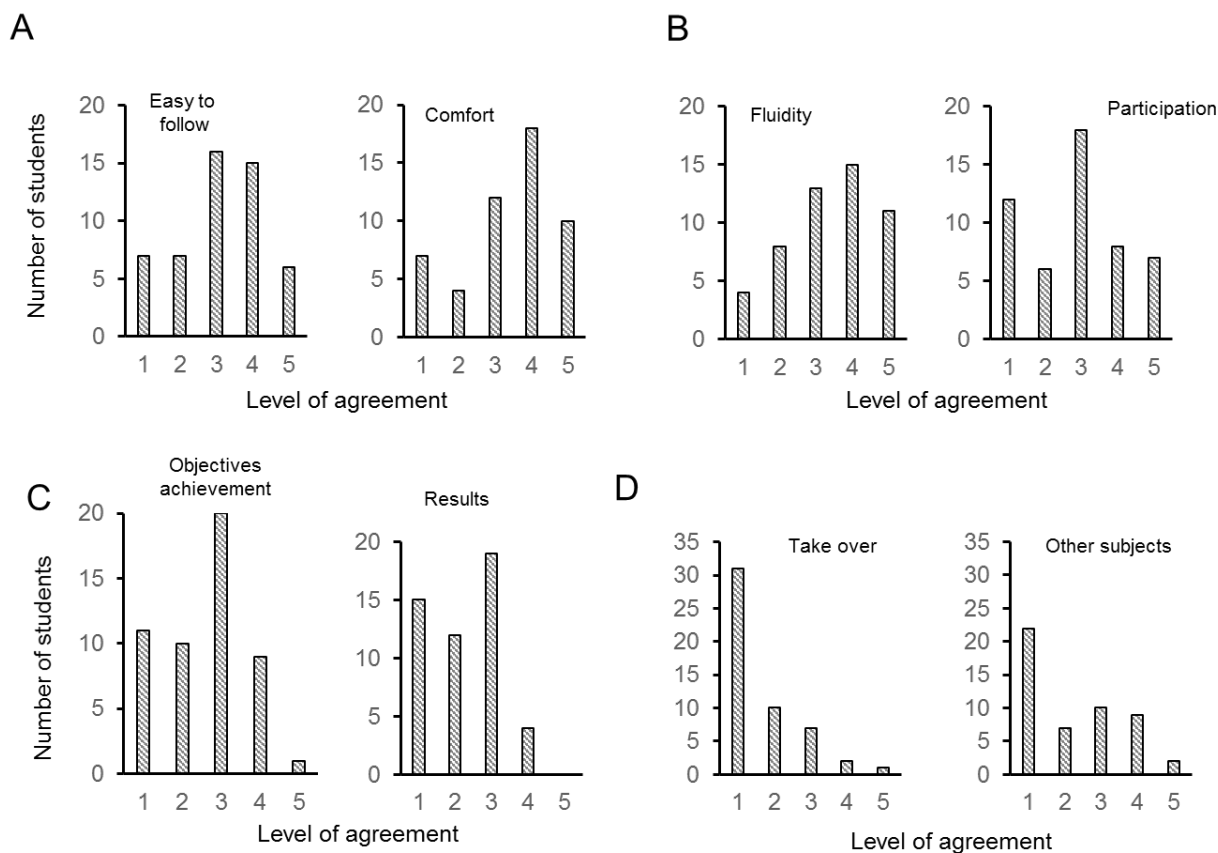

Figure 1: Student's responses to survey's questions. A) Questions related to comfort: online sessions are easier to follow and online sessions are more comfortable. B) Questions related to class dynamics: online sessions are more dynamic and I am more inclined to participate in online sessions. C) Questions related to education achievement: Learning objectives are achieved better in online sessions and my academic results will be better in online teaching. D) Questions related to the future of education: Will online take over in person? and will you like to have more online teaching?

3.3 Qualitative perception of the students

At the end of the survey, we permitted an open space for comments. All responses, as well as the English translation, are in supplemental Table 2. Summing up, students positively acknowledged the possibility of having BC online platform for delivering the course and the possibility of recording sessions. As negative aspects, they mentioned the absence of social intercourse with peers, direct contact with the teacher, and technical issues such as network connectivity.

3.4 Academic results

Finally, we wondered about the influence of synchronous online teaching on the grade obtained by students. The mean grade was 6.76±1.2, which is not statistically different from the mean (6.44±1.32) of the previous 4 years according to the non-parametric Mann-Whitney test (p=0.098).

4. Discussion

Steve Jobs, who was a firm believer in in-person collaboration and opposer to remote work, once said, "Creativity comes from spontaneous meetings, from random discussions. You run into someone, you ask what they're doing, you say 'Wow,' and soon you're cooking up all sorts of ideas" (17). On the other hand, online teaching saves time, permits students to learn at their own pace, enroll individuals with rigid or demanding schedules (18) and reduce costs (19); for these reasons, online courses are expanding rapidly. In this context, it is pertinent to wonder whether online classes are right for everyone. According to a study by Goodwin University, today, about 1 in every 4 students claim that they learn better online (20). This indicates that the majority of students still have the feeling that they perform better in a traditional classroom setting, even though many reports support the notion of a negligible impact (13, 21-23).

We decided to take the opportunity provided by the Covid-19 pandemic lockdown and asked students attending a course with the same instructor but with the novelty of being delivered half in-person half online synchronously to compare both setups. This scenario permitted a framework barely explored so far: the same players (students and instructor) were involved in the two different setups. In consequence, adding this information to the information collected in other setups where students and/or instructors were different between online and in-person will contribute to solving the dichotomy between online and in-person teaching.

4.1 Analysis and conclusions

The analysis of the quantitative results revealed that students perceived home comfort and dynamism as the main advantages in online synchronous teaching. They were indifferent about class participation, although strikingly, in the open question, they appreciated their inclination to participate in online sessions. This intriguing aspect was pointed out by several studies arguing that online sessions provide a feeling of security and willingness to get involved without being exposed (24, 25). Regarding negative aspects, we noted first the student's perception of a slightly worse achievement of educational objectives and, second, the in-advance assumption of worse grades. Interestingly, the absence of differences in the grades between the year 2019-2020 and previous years is against the students' perception. The instructor's perception was that students were more focused, asking more smartly and accurately and, consequently, they went deeper into the subject in the online sessions. To explain this different perception, and entering the field of speculation, students might be less confident in an online setup because physical distance implies isolation and a lack of reinforcement with colleagues. Alternatively, adapting to a new setup requires time and experience, which are difficult to gain in a first attempt. Apart from the above, it will be interesting to check whether students' concerns about grades could be a reflection of the influence of online teaching in the educational achievement of knowledge and competencies.

A qualitative study performed during the same pandemic lockdown context got similar results pointing out the lack of face-to-face interactions as the main negative aspect. This work also remarks on some of the positive elements found here, such as optimization of educational resources and participation (26).

The opportunity to have the sessions recorded represents another interesting element, which is not intrinsic although eased by the technology employed in the online teaching and that was remarkably pointed out by the students. This element, which could be easily

implemented in in-person teaching, represents an aspect to be considered in our future in-person teaching.

Finally, our analysis show that our students (second year medicine students attending a basic subject, in a Spanish (Barcelona) private University) are firmly against moving to online synchronous lessons in their near and far future. Why? Probably because breaking the momentum of in-person teaching means getting out of the comfort zone, probably because University is also about establishing human and professional relationships, probably because elements such as competencies, deep learning, motivation, curiosity, etc, go further than a grade and are more difficult to obtain by online teaching.

4.2 Limitation of the study

The study was restricted to a single group of students in a particular year that permitted, or more accurately, imposed the use of both, in-person and online teaching. Therefore, the conclusions might be influenced by this very unusual lockdown situation that, hopefully, will not happen again, making the continuation and extension of this study difficult.

The study was carried out on medical students enrolled at a private University in the area of Barcelona (70% original from the area, 25% from the rest of Spain, 5% foreigners). Students' social stratum is medium-high without, a priori, limited access to technical elements.

The questionnaire was not previously validated. It was the product of a reflection process performed by the authors.

Supplemental Material: supplemental Table 1 and 2

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SUPPLEMENTAL MATERIAL

Supplemental Table 1: Survey questions

Was Blackboard Collaborate an appropriate solution for online teaching during the Covid-19 lockdown?
Are the online sessions easier to follow than the in-person?
Are the online sessions more comfortable than the in-person?
Are the online classes more dynamic than the in-person?
Is your participation higher online than in person?
Are your learning achievements better online than in person?
Will your academic results be better online than in person?
Do you consider online lectures must take over in-person teaching?
Would you like to have more online teaching in the future?

Supplemental Table 2: Students' answers to the open question: do you have any comments?

BC online classes was not a bad option. As positive, the possibility of revisit recorded sessions. As negative, the annoyance associated with connectivity problems
BC is right even though the window with the teacher image is too small which is not the case using other systems such as Meets.
Online teaching is an emergency solution. I strongly prefer in-person teaching mainly because of the instant feedback, which is not the same during online lectures
Not a big difference. As positive, the participation was increased in online sessions. However, I still prefer in-person sessions because the connection between students and teachers is much better.
I do not think online is better than in-person, but under these circumstances is a good solution and it is functioning properly regarding the delivery of concepts.
Under the circumstances online is being useful, but in-person enhances keeping attention in class and the interaction with the teacher. I think that the fact of being watched by 70 people on a screen hampers participation. I find useful the possibility of recording the lectures.
Online lectures have been fine. I have perceived an increase in participation. The fact of not having the teacher in front of me negatively influenced my motivation, at least at the beginning. Being at home is more comfortable, there is more space. I positively appreciate the fact that the classes can be recorded
I appreciate very much the effort to change to online teaching. In this particular subject, online teaching has proved to be as useful as in-person teaching
Online lessons do not consider students with connectivity problems, making it difficult to keep on with the lectures.
I prefer in-person teaching because at home it is easier to get distracted. However, the teaching quality has not been affected by this situation
I liked very much the solution of online teaching using BC, but it requires a higher degree of commitment than in-person teaching.
Online BC has been a good system under the circumstances. However, one of the better things about the lectures is being there in person, which determines higher participation.
If we weren't under these circumstances, I would prefer in-person teaching
Online BC has been a good solution. However, I prefer in-person teaching because of the contact with my classmates; I miss the possibility of sharing opinions.
I found teachers more involved in keeping on with the teaching. In my view, some students are asking too many questions, making it difficult to keep on with the lecture
Online BC has been a good solution under the circumstances. However, I prefer in-person teaching because I strongly want to be there.

Online BC was a good solution, however, I prefer in-person classes because online hampers the contact between the teacher and students, which in turn, negatively affects the concepts' transmission.
I think online BC has been a good system to adapt to the pandemic situation, But I prefer in-person lessons because the contact teacher-student is essential in the learning process. However, online shows some advantages such as the possibility of recording the lessons. In any case, I think that the quality of the content transmission has not been affected.
Online BC has been a good solution. However, it will never take over the in-person lectures
I think that online lectures is a topic that has made us think a lot. I have confronted opinions. I think online permits adapting the learning pace. In my case, I found useful the possibility of recording the sessions. My conclusion is that online teaching should be used more frequently and in-person teaching should be used for going forward, sharing previous concepts and ideas, debates, practical lessons, help us think and not only learn by heart. In any case, online teaching cannot substitute in-person.
To me online teaching is a source of distraction, it is tiring and I lose attention. In addition, my poor connection makes things even worse.
I think online BC is a good alternative under the circumstances. I like the possibility of recording the sessions.

Original answers in Spanish to the open question: do you have any comments?

- A pesar de las circunstancias creo que la opción que se ha escogido de impartir las clases vía *Collaborate* no es mala. Lo positivo es que la clase queda grabada y puedes repasar el temario de nuevo si es necesario y lo más molesto para mí es el tema de la conexión que algunas veces me ha fallado y me he perdido un poco. Por lo demás, todo muy bien.

- *Collaborate* en general está bien como plataforma. En la vista de alumno el profesor se ve muy pequeño en relación a las diapositivas, por lo que cuesta "ver al profesor". Eso no pasa con google Meets.

- Considero que *Collaborate* es una solución temporal para el momento que estamos viviendo. Aunque personalmente no hay comparación a la presencia en el aula y ese *feedback* que se obtiene, que, aunque se intente conservar por *Collaborate*, no acaba siendo lo mismo.

- No he notado cambios muy relevantes respecto a las clases presenciales. Como positivo podría decir que la participación es bastante mayor en *Collaborate*, pero aun así sigo prefiriendo las clases presenciales ya que se conecta mejor con el profesor y con la clase.

- No es que crea que *Collaborate* sea mejor que una clase presencial, pero para esta asignatura y dadas las circunstancias, creo que está funcionando bien y los conceptos están quedando claros. En mi opinión, las clases de Inmunología en *Collaborate* son provechosas.

- Aunque dadas las circunstancias *Collaborate* sea una opción muy útil, el hecho de ir a clase fomenta la atención y la interactuación con el profesor. A lo mejor es el hecho de ser observado por 70 personas a través de una pantalla que te corte a participar en la clase. Y el hecho de que queden grabadas y puedas ir avanzando y retrocediendo es una herramienta muy útil para entender conceptos.

- Considero que las clases que se han hecho desde el *Collaborate* han sido buenas, además he observado que hay más participación en la clase utilizando el *Collaborate* que una clase presencial. Pero el hecho de no tener un profesor delante mío explicando me desmotiva un

poco al tomar apuntes, al menos durante los primeros días. Aunque si debería mencionar que, al estar en casa escuchando las clases, es más cómodo ya que, tienes más espacio para poder trabajar al menos en mi caso, (en las clases presenciales solo hay sitio para un ordenador nada más), cosa que motiva para realizar apuntes. Yo, por ejemplo, para las clases de inmunología tengo el ordenador para apuntar, una hoja al lado con un resumen de lo que se ha dado hasta ahora, otra hoja para dudas que me quedan que se van clarificando a lo largo de la clase y bolis, lápices y subrayadores para apuntarlo todo. Por otro lado, aprecio mucho que las clases se puedan grabar y guardar y así poder ver la clase otra vez si nos ha quedado cualquier duda.

- Valoro mucho el esfuerzo que ha realizado en la docencia online. Pero debo remarcar que para esta asignatura me ha sido tan útil la docencia online como lo hubiera sido de manera presencial.

- Las clases on-line no tienen en cuenta que hay personas como yo, que tienen una conexión WIFI muy mediocre y las clases se entrecortan constantemente, lo que dificulta más seguir la clase.

- Prefiero las clases presenciales porque el hecho de estar en la comodidad de casa se presta a mas distracciones, pero no porque las explicaciones o la docencia en si del profesor sea peor vía *Collaborate.*

- Me gusta mucho cómo ha continuado la docencia con *Collaborate* aunque sinceramente creo que requiere más compromiso; de haber estado en la universidad hubiese sido más fácil ir a clase y comprometerse.

- Sí que creo que *Collaborate* es un método muy bueno para suplir la presencialidad en estos tiempos, pero una de las mejores cosas de sus clases era la presencialidad y la incitación a la participación en clase.

- Si no estuviésemos en esta situación creo que lo mejor sería las clases presenciales

- Al ser imposible realizar clases presenciales, el *Collaborate* ha sido una herramienta acertada para las clases online. No lo preferiría a las clases presenciales; ir a la universidad, comparar opiniones con los compañeros y demás son cosas que se echan de menos.

- Creo que los profesores están más pendientes de que podamos seguir el ritmo y eso hace la clase más fácil de seguir. Desde mi punto de vista algunos alumnos están preguntando "de más". Entiendo que el objetivo sea que todos lo entendamos, pero hay veces que se preguntan cosas que están escritas en la diapositiva anterior, lo que cual me hace perder el hilo o que se me haga pesado."

- Los métodos utilizados me parecen muy correctos en una situación como esta y no sabría decir como podrían ser mejor. Pero comparándolo con una clase presencial, prefiero totalmente estar presente. Muchas gracias.

- *Collaborate* es una buena herramienta dadas las circunstancias. Aunque considero que son mejores las clases presenciales ja que dificultan el contacto entre estudiantes y profesores y eso, muchas veces, reduce el nivel de impartición de la materia.

- Me parece que *Collaborate* ha sido una muy buena manera de adaptarnos a la situación, pero en mi caso, prefiero en mayor medida las clases presenciales, pues el contacto profesor-estudiante me parece esencial en el aprendizaje. De igual manera, es una herramienta muy útil y sí que tiene ventajas, como poder escuchar la clase nuevamente o en

otro tiempo. En su caso, me parece que la calidad de la transmisión del contenido se ha mantenido mucho y estoy muy agradecida por su esfuerzo, pues he podido mantener la constancia.

- Aunque *Collaborate* ha sido una muy buena solución para el problema que ha supuesto esta pandemia, no puede desplazar las clases presenciales.

- Creo que las clases online nos han dado a todos mucho que pensar, aunque yo tengo opiniones confrontadas. Creo que este sistema permite a todo el mundo seguir la clase ya sean tus capacidades, quiero decir, hay personas a las que les cuesta menos seguir una clase y les resultará mucho más fluido y a otras a las que quizá les cuesta más y siempre la tienen ahí para poder volver a escucharla. En mi caso me es muy útil porque tengo mucha memoria auditiva, y el volver a escuchar la clase me ayuda mucho en el estudio. La conclusión a la que he podido llegar, es que deberían incrementarse las clases a través de *Collaborate*, y utilizar las presenciales para ir más allá. Creo que algo muy útil sería en vez de ir a una clase sin tener ni idea de lo que se dará, ir ya con una base de los conocimientos (clases dadas virtuales) y utilizar las presenciales para cosas prácticas, debates, adquirir nuevas habilidades, ayudarnos a pensar y no solo memorizar... Hoy en día podemos a acceder a toda la información que queramos y me parece muy útil aprender a manejarla. Por último, recalcar que desde mi punto de vista *Collaborate* no debería reemplazar la docencia presencial."

- Me parece que la docencia online, al menos para mí supone una distracción constante, ya que estar escuchando una pantalla todo el rato se me hace cansado y al final acabo sin prestar atención, eso sin tener en cuenta que la conexión (mía) es inestable y a veces me resulta difícil seguir las clases.

- Creo que *Collaborate* es una muy buena alternativa en esta situación y también al tener disponibilidad de ver las clases grabadas nos da pie a que si no entendimos algo podemos volver a escucharlo.