

Faculté de philosophie, arts et lettres

New technologies used in the teaching and learning of ballet and the impact of the Covid-19 pandemic: A qualitative analysis of students' evaluation and experience.

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Introduction

As explained by Bonis and Lartigues (Encyclopædia Universalis), “the first ballet was danced on 15 October 1581 in the great hall of the Petit-Bourbon in the Louvre, on the occasion of the marriage of the Duke of Joyeuse, a favourite of Henri III, with Miss de Vaudémont, sister of Queen Louise of Lorraine¹” (free translation). Since then, this art, which mixes dance, music and poetry, has become very much appreciated by children, teenagers, adults and elderly alike. But who could have imagined that such an art, which dates back to the 16th century, would have been so affected by the arrival of new technologies?

This master thesis aims at studying the emergence of new technologies in the teaching and learning of dance and understanding both the advantages and the disadvantages they bring at the same time. It is important to note that these new technologies like the CAVE environment, the Virtual Reality, VideoTrace or the Web-based Information and Technology applications are not yet used in Belgium. However, these are mostly used in the United States of America and in Canada, as reflected by most of the sources that can be found on this subject. The reason why I have decided to analyse one by one five of the most used of them in order to understand how they work, how the lesson is given and thus be able to discuss their advantages and/or disadvantages, is because Belgian dancers are still unfamiliar with the use of these new technologies. One part of this study is based on a detailed presentation of five technologies to different Belgian dancers who are still unacquainted with them, to explain to them how they work and thus be able to gather their opinions in order to find out whether the use of these new technologies could have positive consequences in the Belgian world of classical dance. Unfortunately, the years 2020 and 2021 have been strongly hit by the arrival of the Covid-19 pandemic and my intentions to personally meet the ballet students were quickly wiped out. I had to figure out which solution was the best suited to be able to meet them anyway. And in a rather amusing way, technology was obviously the answer to my question: I was able to meet students virtually. As we all know, Covid-19 has really changed the world, everyday habits and the way we interact with each other. For instance, all primary and secondary schools had to be closed during the strict lockdown in the spring of 2020. Covid - 19's consequences strongly impacted the learning of ballet as ballet schools had to close their doors repeatedly and for a long time. This is why I decided to also study the impact of the virus in the dancing education field in general all around the world and then in a more in-depth way thanks to questionnaires sent to people from different backgrounds, like students, a teacher and a director, to understand the impact of the pandemic in the teaching and learning of classical dance in Belgium.

To do so, this master thesis is divided into three main chapters.

Although new technologies are beginning to be adopted more and more everywhere, and particularly in the world of dance, none of these new technologies is fully mastered by experienced teacher who can help, encourage and advise students. However, as Warren (1996) explains so clearly in her book, the teacher as such is the centrepiece of a successful ballet class. This is why, the first chapter starts by introducing three influential ballet teachers, namely Marika Besobrasova, Willam Christensen and Larry Long, who, in their own way, clearly marked the world of 20th century classical dance. The focus is essentially on their original way of teaching ballet, which made them stand out and become renowned. The first chapter also aims at discussing some of the most utilised new technologies in the teaching and learning of dance: The Cave Automatic Virtual Environment (CAVE), the Virtual Reality Dance Training

¹ <https://www.universalis.fr/encyclopedie/ballet/>

System using Motion Capture Technology, VideoTrace, Web-based Information and Technology applications and DanceForms. As highlighted by many ballet students and teachers, feedback in the learning of ballet is absolutely essential. The way these new technologies give feedback will thus be given specific focus.

Chapter two is devoted to the opinions of three Belgian students who studied classical dance at the Royal School of Antwerp and whose sole purpose is to make it as professional dancers. The chapter aims to answer the following question: Would these technologies be welcomed in Belgian dance schools according to the students themselves? Before the students were interviewed, a PowerPoint presentation was used to explain the five new technologies under study. I presented the technologies to them one by one and checked that they had understood everything, I asked them several questions designed to explore their opinions on them. The interviewing process is described in the chapter and the students' opinions are discussed.

Chapter three discusses the impact that the Covid-19 pandemic has had and continues to have on the world of education, and more specifically on the field of classical dance education. A first section illustrates the major consequences that this pandemic has had around the world and also analyses the sanitary measures that have been formulated and applied in order to limit the spread of the virus as much as possible. The second part focuses on the opinions of ballet students (the same three students who were interviewed in the second chapter), a teacher and a director who all experienced learning and teaching of dance during the pandemic.

The last part of this master thesis is the conclusion. This conclusion will allow us to clearly summarise the answers to the main research questions of this thesis:

1. Would the five new technologies presented in chapter one be welcomed in Belgian dance schools according to the students themselves?
2. What were the most negative and positive consequences of the Covid-19 pandemic and lockdown for students, a teacher and a director?

1. Chapter One: Ballet teaching: from traditional to virtual teaching

This first chapter is made up of two main parts. The first part focuses on three ballet masters that have left their mark on the 20th century, namely Marika Besobrasova, Willam Christensen and Larry Long. The focus is essentially on their original way of teaching ballet, which made them stand out and become renowned. The second part of this first chapter aims at studying five new technologies which are currently used in the field of dance: The Cave Automatic Virtual Environment (CAVE), the Virtual Reality (VR), VideoTrace, Web-based Information and Communication Technology like DiViDU and DanceForms. The objective is to get a full understanding of how they work.

1.1. Some teachers who have left their mark on the 20th century world of classical dance

As mentioned by Nichelle (2009), teaching ballet requires a lot of patience. Patience is thus an essential characteristic for a ballet teacher. But patience is not the only factor for succeeding as a good teacher. Some twentieth-century teachers have understood that and thanks to their original manner of teaching ballet, they have become masters in their field. This section will focus on three of them, namely Marika Besobrasova, Willam Christensen and Larry Long. What did these three famous teachers accomplish to be remembered as masters in ballet teaching? They all had their own way of teaching ballet but some similarities between their approaches can be found.

1.1.1. Marika Besobrasova

As explained by Warren (1996), Marika Besobrasova was born in 1918 in Russia but raised in France. She started her ballet teacher career very early. In fact, as pointed out by Warren (1996), she founded the *Ballet de Cannes de Marika Besobrasova* when she was only in her twenties. Later, in 1947, she opened her own academy in Monte Carlo called *Casa Mia*. When the reader goes through Warren's book, one of the first things he can read about Marika Besobrasova is her saying:

I am not a teacher; I am a master – something much more than a teacher. If I'm only a teacher, I will make sure that you begin class on time, finish on time, that you don't miss a class and that you know your program. And I will correct your physical and even musical mistakes, but will not look at your entire life. As a master, I have the right to examine the way a student lives [...] As a master I have the right to say anything to my pupils. I look further than just teaching- into their souls, not just at the skin. (Marika Besobrasova cited in Warren, 1996:15).

Her way of seeing her job as a master and not as a simple teacher is certainly one of the characteristics that made her famous. As explained by Warren (1996), Marika Besobrasova has really created her own approach of teaching and it was quite "motherly". She, herself, explained her views on that motherly teaching by saying:

I try to develop the capacity with myself to penetrate my students. I stop all my own thoughts and feelings and just go in them. It's a very difficult task because you agree to abdicate yourself, but, in doing so, you start to feel how they feel when they are moving.

Then I understand how they are working their machine and what is wrong. (Marika Besobrasova cited in Warren, 1996:16).

Her goal was to fully focus on her students to be able to see everything that was going on well but also what was not happening as well as she would have liked it. When she saw something wrong, she could express it easily with her students thanks to her knowledge of different languages. In fact, as explained in Warren's book, she lived her childhood in a convent where she had to switch between English, French and Russian every day. Later, she also studied German and Italian. She could thus communicate easily with her students coming from all over the world.

Regarding her approach to teaching, two elements took the lead: the breath and the anatomy. Indeed, as explained by Warren (1996), Marika Besobrasova attached great importance to breathing: "Breath is life, you don't breathe, you don't live" (Marika Besobrasova cited in Warren, 1996:20). In every lesson, she would pay attention to the way her students breathed. For instance, at the end of each class, as explained by Warren (1996), she would make her students stand without moving for 15 seconds. Marika told her students to "find the inner calm within yourself. You must be able to stand quietly without agitation, even if the music is still very strong". (Marika Besobrasova cited in Warren, 1996:32).

Marika Besobrasova studied the anatomy to be able to use it as a form of correction while teaching:

If you make a correction with a physical touch on a student's body, then you have to get a physical answer to what you are doing. So you must be patient with your hands. You must wait for the muscles underneath your hands to act. This is how you will know the body has registered the correction, and you must have the sensibility to feel not only when the muscle responds, but also how much it has responded. (Marika Besobrasova cited in Warren, 1996:27).

But Marika Besobrasova did not only make corrections in regard with anatomy, she also taught anatomy to her students. She wanted them to understand the muscles and feel them. To do so, as reported by Warren (1996:28), she has created "a series of exercises on the floor for each muscles group". She would take the necessary time to teach her students the purpose of each and every muscle in their body:

First, she will have the child use the muscle while lying on the floor. Then she will show him a picture of the muscle and demonstrate where it attaches on the skeleton. Then she will place his hand on her own body so that he can feel the action of the muscle. Finally, she will place her hands on him as he does the movement. After she is certain that he feels the muscle, she will have him do the *tendu* first on the first leg, then on the other. (Marika Besobrasova cited in Warren, 1996:28).

The students would need several repetitions in order to record the move correctly in their muscular memory.

Musicality was also important to her. This is why she used "recorded music, custom-made by her favourite pianist" which "deliberately stops for a few counts mid-exercise" during which the students had to continue dancing. Her goal was, as explained by Warren (1996:34), to challenge "students to not lose a beat and to be exactly on the music when it comes in again".

In conclusion, breath, anatomy and musicality were very essential elements to Marika but her overall goal for every lesson was “to create a family meeting and not a lecture atmosphere” (Warren, 1996:38).

1.1.2. Willam Christensen

Willam Christensen (1902-2001) received prestigious awards such as the Dance Magazine and Capezio awards (Warren, 1996:45).

Two elements that were extremely important to Mr Christensen were the expression of his students while dancing and the musicality. He thinks that “dancing without drama is pointless” and says, “now expression or give up!” (Warren, 1996:46). He thought that every movement “should express an emotion”, that students need “to colour their movements”, he wanted his students “to have expression, not to be dull”. One of his particular characteristics as a ballet teacher was that, as explained by Warren (1996:43), he always spoke in parables because he thought that “if you give it to them straight, they won’t get it”. He said the following: “I try to make sure the dancers really have to think about what I am trying to say”.

Another characteristic of Mr Christensen’s way of teaching was how he corrected his students. He knew that corrections were more easily accepted with a bit of humour. He always tried to correct a student while “building up his student’s ego”. One example given by Warren is this following one: “if you would fix that *port de bras*, you would be a very good dancer” (William Christensen cited by Warren, 1996:57).

Just like Marika Besobrasova, he attached great importance to musicality. In order to train his students’ musicality, he often asked them to just listen to the music without doing anything else. Another characteristic of his original method of teaching was that, as mentioned by Warren (1996), there were no mirrors in his studio. In fact, Willam Christensen believed that “positions of classical ballet must be practiced without a mirror, by feeling them” (William Christensen cited by Warren, 1996:56). Like Marika Besobrasova, Willam Christensen attached high importance to anatomy. He even said that if somebody is a good teacher, that person must be able to see what is not going on well in the body of a student and that he/she must be able to fix it; if he/she is not able to do that, he/she is just a teacher that teaches steps.

1.1.3. Larry Long

The third and last teacher I wanted to talk about in this first chapter is Larry Long (1936-2009). As reported by Warren (1996:141), Larry Long was “one of the preeminent teachers in the American Midwest” and he was “appointed Ballet master in 1962”. Like Willam Christensen, the expression of his students while dancing did really matter to him. His motto was even “Dance with colour” (Warren, 1996:141). One characteristic of his original way of teaching was the fact that “he [didn’t²] count when he [taught], he [scatted]: his voice [commented] rhythmically the music and that [guided] the students”. Another distinctive element was that he never prepared his lessons: “I like to be free to take class where it needs to go on that particular day [...]” (Larry Long cited by Warren, 1996:148). Like Willam Christensen and Marika Besobrasova, he paid particular attention to musicality. As explained in Warren’s book, “Long [would] ask his pianist to play strong, clear rhythms so the student [could] try to train his ears. To help in the musicality, Long [taught] with a stick. He [used] it as a percussive instrument”

² The original quotation was in the simple present, but to respect the sentences’ tenses, I modified them in past tenses

(Warren, 1996:155). He had another common feature with Christensen in that he liked to talk in a way that pushed his students to think in order to understand. In addition, he tried to make sure that his students did not look at themselves too much in the mirror and always corrected them with a bit of humour. According to him, the most important element to be a good teacher was to “inspire” (Larry Long cited by Warren, 1996:166).

1.2. An alternative to the traditional way of teaching ballet: Virtual teaching thanks to new technologies

1.2.1. Introduction to the new technologies that are already used in ballet school

Muneesawang et al. (2015:80) report that in the past decades, the principal method used to teach dance was the use of demonstration-performance exercises. This means that teachers normally start by showing a movement once or twice and then students have to repeat it.

Almost 30 years ago, as Muneesawang et al. (2015) explain, ballet dancers began to use videos to pass on some choreographies to new generations.

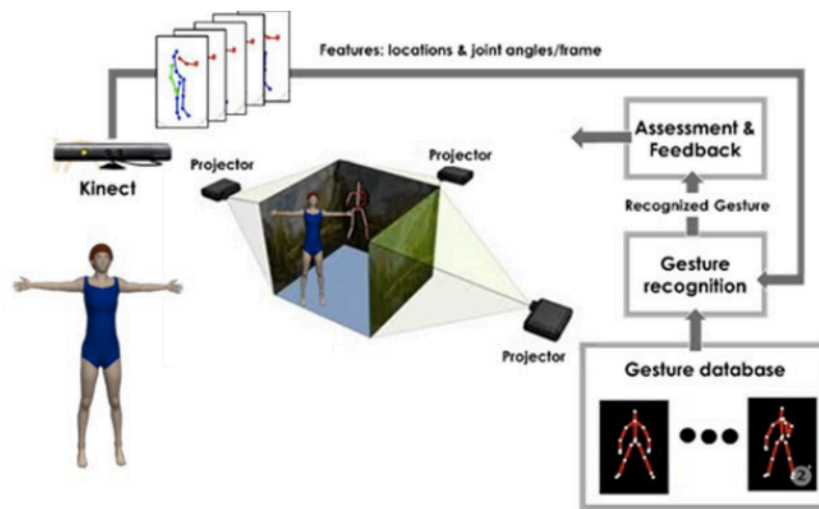
But today, more and more ballet schools are having recourse to technologies for teaching or giving feedback. According to previous research carried out around the world (e.g., Leijen, 2008 with DiViDU), some of them are perceived as more useful than others by students.

This chapter discusses some of the most frequently used technologies in ballet teaching. These include the Cave Automatic Virtual Environment, the Virtual Reality Dance Training System, the VideoTrace, ICT applications and more particularly DiViDU and DanceForms.

1.2.1.1. The Cave Automatic Virtual Environment (CAVE)

As pointed out by Muneesawang et al. (2015:81), the Cave Automatic Environment (CAVE) provides “dancers with enhanced feedback and spatial awareness of their movements relative to the virtual instructor”. In this system, the teacher is thus virtual and is projected on a screen in front of the student. The student is inside a so-called “cave” and the teacher is in front of him/her, on one of the walls of the cave. As can be determined from the sources used, this technology is, for the moment, mainly used and known in the USA and Canada.

Figure 1: The CAVE

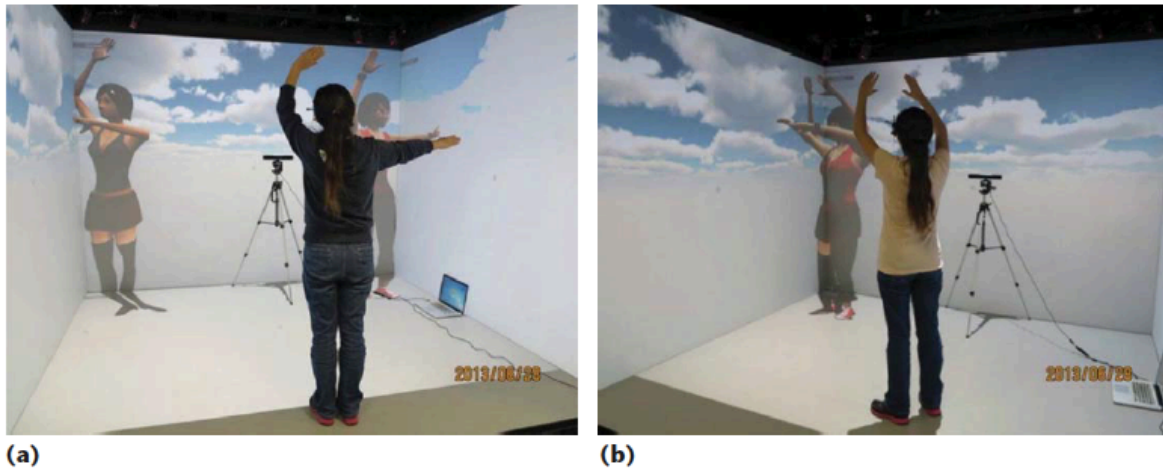


(Muneesawang et al., 2015, “Virtual reality (VR) dance training system architecture. Our system incorporates four components: a Kinect sensor, CAVE, gesture recognition, and visual feedback.”).

As it can be seen in figure 1, there are four components to this CAVE: a Kinect sensor (it is used to be able to control an interface without the need for a joystick), a CAVE (Cave Automatic Virtual Environment), gesture recognition and visual feedback. To be able to give feedback, the machine first detects all the different movements thanks to the Kinect sensor and compares them with the movements of the teacher projected on the wall. One of the benefits of augmented reality is that students have the possibility of receiving feedback after, but also during the performance. When feedback is provided during the performance, it is called “concurrent feedback” and when it is given after the performance, it is called “terminal feedback”. Muneesawang et al. (2015:82) explain that “concurrent visual feedback presents side-by-side or superimposed moving-image visualizations of the ideal movement and the student’s actual performance”. This kind of feedback is particularly useful for complex tasks as it gives the student the opportunity to immediately see his/her mistake and he/she can attempt to improve the movement straight away. As explained by Muneesawang et al. (2015), terminal feedback, on the other hand, is given at the end of the performance, as a summary of the mistakes made by the student; this terminal feedback is reportedly less effective than the concurrent feedback for complex tasks.

In the Cave Automatic Virtual Environment, the student first watches the teacher’s video recorded performance and then tries to repeat the exercise. Once the student has completed the moves, the gesture recognition system is activated, and the gestures of the student are sent to the feedback system. The feedback is then projected onto the wall and the student is able to see it. If the student tries again, the system will automatically recognise the movement he/she is doing, and the system will provide concurrent feedback. As illustrated in Figure 2, this feedback can be side-by-side or superimposed to give the student a real-time analysis of his/her work. To be able to see their feedback, students need to wear stereo glasses with optical markers, which allows 3D visualisation. (Muneesawang et al., 2015)

Figure 2: “VR dance training with feedback protocols. (a) Side-by-side feedback and (b) superimposed feedback” (Muneesawang et al., 2015: 86)

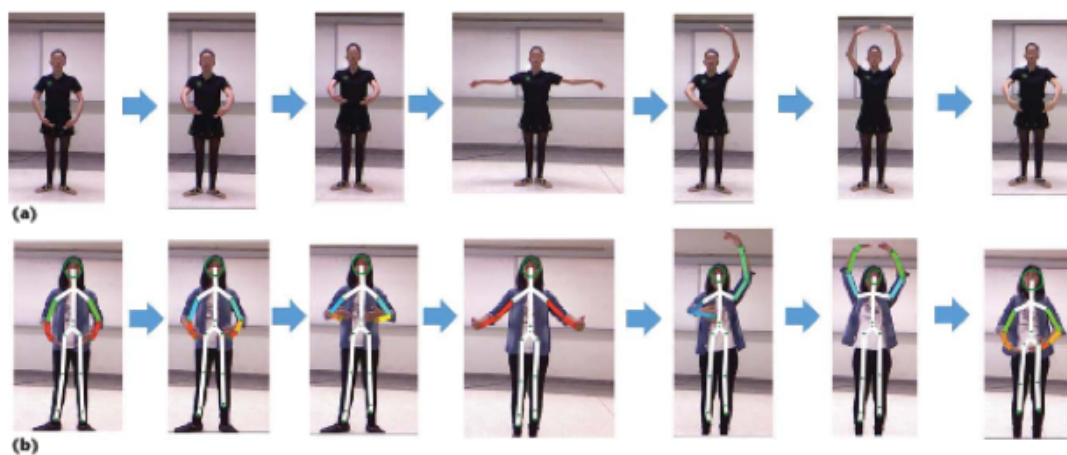


Thereafter, to give more details about the movements which were not 100% correct, the CAVE system offers a skeletal feature data from the teacher's example and compares it in real time with the student's work. Colours are used to give this feedback on the skeletal feature. As pointed out by Muneesawang et al. (2015:87), “the color stays closer to blue if the student is doing well and shifts towards red as the performance worsens”.

Figure 3 shows the feedback given to a student while performing a dance sequence. The first row of pictures, cf. (a), exhibits the teacher's performance. The second row of pictures, cf. (b) shows the student's performance in the form of a skeleton. In this second row, the blue colour means that the position of the student is correct and the red one means it is completely incorrect. The green and yellow colours mean it is not exactly what the teacher did and the orange one means that is almost incorrect.

To get this feedback, the student has to be facing a camera. According to Muneesawang et al. (2015:91), the Kinect does not properly capture positions that involve bending backward.

Figure 3: “Descriptive feedback presented to a student while performing a dance sequence, based on a comparison with (a) the teacher's performance. (b) The student receives feedback in the form of colors of the skeleton” (Muneesawang et al., 2015: 90)



The CAVE environment has a series of advantages but also some flaws.

The CAVE environment offers two kinds of feedback: concurrent feedback and terminal feedback. Students can choose which feedback they prefer using during their training. The colour coding used to show the feedback is easily understandable. If the student is currently dancing and sees that his/her left arm is red on the screen, he/she could fairly quickly attempt to change his/her position for instance.

The CAVE environment allows any student to work whenever he/she wants because the teacher does not need to be present. Students can thus even work during their free time if they wish. Another advantage is that CAVE recognises a move that has already been completed. It means the CAVE will be able to give the student concurrent feedback as soon as the move is recognised.

According to Muneesawang et al. (2015), the CAVE environment makes it difficult to capture movements that involve bending backward. The authors also stress that in order to receive their feedback, students have to face the camera. But if they are receiving concurrent feedback while dancing, students may not be facing the camera at the moment of the concurrent feedback.

One possible manner of solving this problem would be to project the concurrent feedback on all the walls of the cave and not only on the front screen.

1.2.1.2. Virtual Reality Dance Training System using Motion Capture Technology

The Virtual Reality Dance Training System using Motion Capture Technology (henceforth VR) shares some common features with the previously described CAVE environment. One of the biggest similarities is that the VR also projects a virtual teacher on a wall so that the student can imitate it.

But the VR has a different story. In fact, some years ago, people who wanted to learn dance during their free time but who did not want to take dance classes, had the possibility to watch self-learning videos. These videos can still be found on YouTube for instance or even in some video games, but they do not offer any feedback. Consequently, these videos are better suited for entertainment than for a deep study of dance.

To respond to this lack of feedback, a virtual reality training application integrated with motion capture technology was created. As mentioned by Chan et al. (2011:188), these VR applications “assist people to get immersed into the virtual world and experience a real world like or an imaginative virtual world”.

One of these VR applications used in dance was created by Nakamura et al. (2005). They designed a training tool for dancing which sends vibrations to the student when he/she is supposed to make a move.

Figure 4: “Contemporary dance motion capture session in Amsterdam, Holland. Copyright: 2016 WhoLoDancE photographer Giulio Bottini” (Cisneros et al., 2019:8)



As illustrated in Figure 4, students need to wear a capture suit in order to fit these VR applications requirements correctly. Thanks to the motion capture system, the system collects enough data to compare the teacher's performance with the student's.

Some of these VR applications are now created to try and replace the teacher-to-student way of teaching. A virtual teacher is projected and students wearing the capture suit just have to follow his movements. To receive feedback, the system has to match two sets of motions: those of the teacher and those of the student. Afterwards, the system can compare the student's motion to the teacher's motion and give feedback. As explained by Chan et al. (2011:188), the recognition of the motion “is based on joint angles of 10 body parts including head, torso, upper arms, forearms, upper legs, and lower legs but ignores those of the hands and feet”.

The VR applications include four components: 3D graphics, motion matching, motion database and motion capture system: “The user's movements, which are obtained by the motion capture system are compared with the motions in the motion database through the motion-matching component. The 3D graphics component visualizes the movements by the user and the virtual teacher (template motion)” (Chan et al., 2011:189).

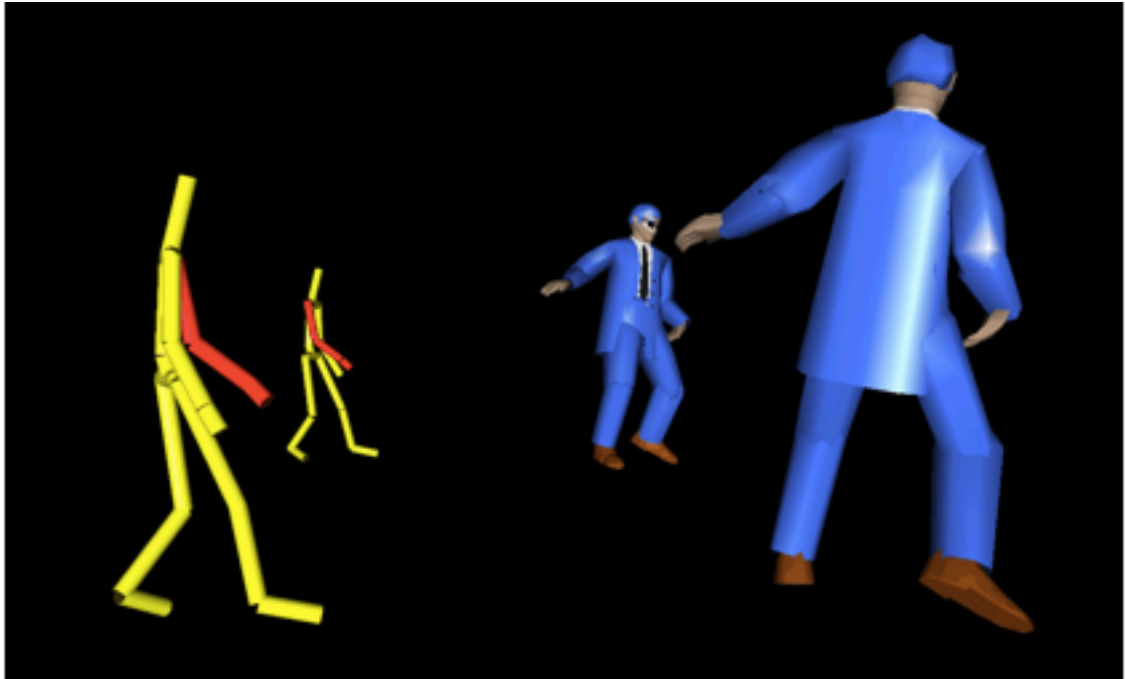
To be able to perform correctly, students have to see and understand the moves. So, first of all, the virtual teacher shows the move, and this is done in 3D mode. If students think the virtual teacher is going too fast, they can change the speed of the demonstration. The teacher can also appear when the student is dancing so that he/she still can imitate the moves of the teacher or see what he/she is doing wrong. A mirroring effect is also added to the virtual agents on the screen, so the students have the same feeling as if they were dancing in a real class.

Like the CAVE environment, the VR applications offer different kinds of feedback.

- Immediate Feedback:

In this case, the movements the student is making are captured in real time while practicing and they are represented on the screen next to the virtual teacher. As illustrated in Figure 5, the student is thus represented in the form of cylinders of different colours. If a part is red-coloured, it means that this part is wrongly positioned.

Figure 5: “A sample of immediate Feedback” (Chan et al., 2011:190)



Thanks to the immediate feedback, the student can see his/her mistake live and can change his/her position:

The color depends on how accurate each joint is moved in a posture. It is calculated by the euclidean distance between the template posture and the student's posture. When the distance regarding a particular joint is higher than a threshold, the color of the corresponding body part will be shaded in yellow, which means acceptably correct. Otherwise, a red color is shaded, which means the instantaneous posture seems incorrect. (Chan et al., 2011:191).

The colour is white when the euclidean distance equals 0.

- Score report:

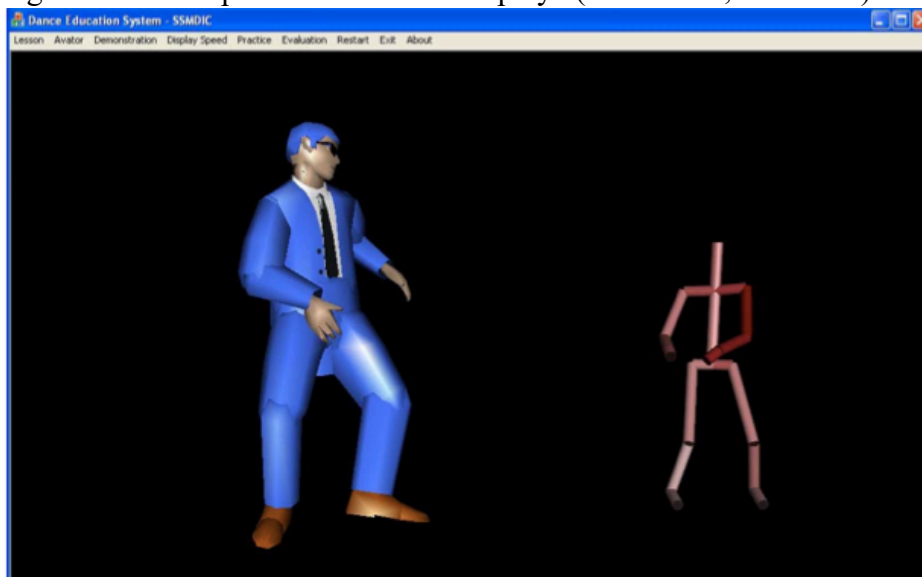
Figure 6: “A sample of score report” (Chan et al., 2011:190).



The score report is given at the end of the performance. As illustrated in Figure 6, it provides general feedback for the whole performance.

- Slow motion replay:

Figure 7: “A sample of slow-motion replay” (Chan et al., 2011:190)



It is a sort of replay where the student can see where and when he/she made errors. As explained by Chan et al. (2011), these errors are from deep red to white. The red parts are those of the body which were wrongly positioned, and the white parts were the correct ones.

Each kind of feedback presented involves a comparison between two motions: the teacher's motion and the student's motion. The student's motion can thereafter be compared to the

teacher's motion and the student can receive his/her feedback and then try again as many times as he/she wants.

In conclusion, the CAVE environment and this VR work as a "real" class: first the teacher, who is virtual in this case, shows the exercise, then the student performs it and then receives feedback. As mentioned earlier, these technologies allow students to work during their free time and where they want.

1.2.1.3. A digital annotation tool: VideoTrace

In a traditional dance class, students can only perform a routine once or twice so as to give the opportunity to every ballet student to train and to receive feedback from the teacher. In order to give this feedback, the teacher has to remember every mistake the student made or where and when he/she performed well. The student also has to remember his/her movements to be able to understand the teacher's feedback and to be able to fully understand the teacher's explanations.

Our memory is not always as good as we wish and, therefore, the probability that the teacher forgets a mistake or that the student does not remember his/her movement is high. It can thus have consequences on the student's performances and/or on the teacher's evaluation.

VideoTrace can help. As explained by Cherry et al. (2003), VideoTrace, is a digital annotation tool which allows users (teachers as well as students) to capture videos and to annotate them (to remember something for instance). These videos can be saved, watched again and commented as much as the users want. Thanks to VideoTrace, students and teachers have the opportunity to see a performance as many times as they want and do not need to remember every single move.

Stevens and the PETTT³ Video Traces Research Group at the University of Washington collaborated on the design of this system.

As pointed out by Cherry et al. (2003), VideoTrace has different characteristics:

- First of all, VideoTrace allows students to watch the video of a performance and to annotate it by talking. VideoTrace offers the possibility to slow down the video if it is too fast or if the user wants to watch something in more detail, a special gesture for example.
- The user also has the possibility to stop the video in order to show something on the screen.
- To show something on the video, the "finger tool" can be used. It will appear if you move the cursor. For instance, this feature can help teachers to show the student a mistake he/she has made.
- Thanks to VideoTrace, videos can be organised in different files and can be sorted according to the title, author, date and time recorded, ...

³ The Program for Educational Transformation of Technology

This video annotation tool is slightly different from the two previous technologies described above, *i.e.*, the CAVE environment and the VR. Actually, this VideoTrace is not a technology that allows students to work during their free time with an avatar or a teacher projected on a wall. VideoTrace is all about another purpose. This technology is an annotation video tool that has been created so that students and teachers have the possibility to record dance performances and then to be able to watch those as much as they want. The goal is, thus, to allow students and teachers to focus completely on the performance but without having to remember each mistake or each little detail. Thanks to VideoTrace, teachers can watch the video again to give extensive feedback and students can watch their performance again to see where they have made mistakes.

As pointed out by Cherry et al. (2003), the feedback can be given orally during a class while watching the video or teachers can also annotate the video so that students can receive their feedback in written form while watching their dance on VideoTrace. Another advantage of this particular kind of technology is that if students or teachers want to focus on a special moment of the routine, they can slow down the video or even stop it for a while.

For now, the conclusion can be drawn that new technologies in the learning of dance are different from those in the teaching of it. Some of them can be used to try to replace the traditional way of teaching ballet while creating an avatar working as a teacher or while projecting a teacher on a wall. These kinds of technologies allow students to work on their own whenever they want. The feedback they receive will be given by comparing their performance with the teacher's performance. Others, like VideoTrace, do not allow students to work on their own. A proper use of these technologies requires students to attend "real" classes with "real" teachers. The goal of these technologies is to offer students and teachers the possibility to watch and rewatch a performance as many times as they want. Without this kind of technology, teachers only have the possibility to watch a student's performance once or twice to give the opportunity to each student to perform.

1.2.1.4. Web-based ICT (Information and Communication Technology) applications

According to Leijen (2008), ICT intervention should facilitate practical dance classes in three different ways. Its first goal is to facilitate teaching and learning. Second, it aims at giving students a more active role in the class, and, finally, its third objective is to be considered as pedagogical support. To be able to see if these ICT applications are useful during dance classes, it is essential to study the different classes and their goals.

In the study of ballet, there are two major classes which are called "the choreography class" and "the technique class" (Leijen, 2008). First, the choreography class. As pointed out by Leijen (2008:57), its aim is to develop students' creativity, imagination and feelings to create a new dance. In these choreography classes, the way of teaching and learning is "traditional". In fact, teachers demonstrate the task and students try to repeat it. As soon as the students have become more comfortable with the movements, they are encouraged to add their materials and to become more creative.

During this type of class, students' creative expression is assessed because, according to the teachers, students' expression is their way to communicate with the public. As reported by Leijen (2008:59), students' knowledge on dance is also controlled. The last approach to assess

students is in the form of written assignments. In these written assignments, students have to reflect on their progression and on their work.

Second, the technique class aims at “training physical skills, learning general movement principles and a specific dance style” (Leijen, 2008:59). According to technique teachers, it is also essential to teach students the meaning associated to the dance or to the movements they are making. Because the first aim is to train physical skills and to learn a specific dance, students have to first watch the teacher’s performance in order to understand it and to be able to repeat it. It can thus be said that it is a traditional way of teaching. The teacher shows and the student repeats. Assessment in this technique class is based on students’ creative expression and physical skills (Leijen, 2008:61). Students’ physical skills and technique are, however, some of the most assessed skills in this case because they are part of the general objective of the class. Students may also be assessed through written reflections and discussions.

As explained earlier, students’ reflections on their work are important. ICT applications might then be very useful if they could help students in their written reflections. ICT applications can in fact be used to help students in their process of reflection. One ICT application which is used to help is called DiViDU. DiViDU is:

a video-based learning environment developed for learning tasks based on authentic practical situations; it covers three learning processes: learning to analyse authentic situations, learning to reflect on these situations, and learning to demonstrate acquired competences. (Leijen, 2008:115).

As Moon said, “Reflection leads to deeper learning” (Moon cited in Leijen, 2008:90). So, reflection is necessary to raise students’ awareness of their work. Thanks to this reflection, they can achieve high-quality dance skills. Moreover, reflection gives them the opportunity to try to understand how the audience perceives their work. But reflection is not a piece of cake. According to Procee (2006), there are four general processes of reflection: describing an experience, evaluating an experience, learning from multiple perspectives and reflecting on the reflection process.

DiViDU being a video-based learning environment, students have the possibility to film their performance (as explained earlier with the VideoTrace system). Thanks to video recordings, students can watch their performance as much as they want and can reflect on it more easily (without having to memorise every gesture or mistake). With the videos, students can develop a realistic vision of their work:

Students make digital video recordings of their practice using a video camera, select video fragments during video editing, and upload these on a streaming media server. The programme Windows Movie Maker was used for video editing. Using DiViDU, students can review these video recordings, analyse their own practice, connect theoretical concepts with their own performance, consider alternative behaviours, and get feedback from peers and the teacher. All these learning activities are integrated in one environment. (Leijen, 2008:115).

Students also have the possibility to select images they want to focus on for their reflection work. In the DiViDU environment, teachers can give students reflection questions and give them criteria to pass the assignment.

a) “Describing an experience” (Leijen, 2008:109) in the ballet class

In the written assessments that students have to write to be evaluated, they first of all have to describe their experience in the ballet class. According to the study carried out by Leijen (2008), half of the students reported that the DiViDU resulted in a positive influence. The fact of editing a video helped students to choose a starting point in their analysis. However, students were more reluctant about video viewing. Some of them “stated that since they had seen the combination already in class, viewing the recording of the composition was not useful” (Leijen, 2008:118) while others assured that being able to watch the video again gave them the opportunity to see the reality.

According to the teachers taking part in the survey, this kind of facilitation is really useful because “when you are dancing in the studio, you have the mirror, of course, and that is a very immediate reflection in real time, but there is not enough time for the mind to translate what you see” (Leijen, 2008:120).

b) “Evaluating an experience” (Leijen, 2008:109) in the ballet class

In the written assessment, students then have to evaluate their experience in the ballet class. But the question is: does the ICT facilitation help students to reflect on this point too? Students taking part in Leijen’s survey (2008) said that ICT facilitation had a positive influence on this kind of reflection too. They were of the opinion that comments made by teachers in class became more meaningful in the course of self-evaluation. Being able to watch their performance again gives students the opportunity to better understand the teacher’s feedback.

c) “Relating to multiple perspectives” (Leijen, 2008:109) in the ballet class

The last point students had to reflect on to be assessed in this ballet technique class was the use of multiple perspectives. According to the study carried out by Leijen (2008), students were divided on the advantages of written feedback in the DiViDU environment. They were however, of the opinion that written feedback in DiViDU was considered more rational than feedback in a face-to-face situation. Moreover, all the students stated that DiViDU was a safe environment for students to share their ideas.

d) Are Information and Communication Technology applications useful?

According to this survey carried out by Leijen (2008), students and teachers agree that this kind of facilitation has a lot of advantages and only few disadvantages. It can thus be said that DiViDU is a good environment for dance learning students. This ICT helps them to better understand the teacher’s feedback and gives them the opportunity to watch their performance as much as they want. But DiViDU also allows students to share their ideas in a safe environment and helps them to better reflect on their work:

[...] a video-based learning environment can support dance students in describing and evaluating their practical experiences and relating to multiple perspectives in a detailed and functional manner provided the experiences captured on video are meaningful to revisit in the students’ view, sufficient scaffolding in the form of questions and criteria is provided by the teacher, and peers with diverse experiences and/or perspectives are encouraged to share their ideas in a group. (Leijen, 2008:129).

As a conclusion, the results of the survey show that Information and Communication Technology applications are useful in the learning and teaching of dance. These applications are useful in the way students have to reflect on their work.

1.2.1.5. DanceForms

According to the DanceForms website, DanceForms is “choreography software designed with dance teachers and choreographers⁴”. As explained by Rhonda Ryman in her PowerPoint presentation for *the CORPS de Ballet International Conference* in South Carolina in 2004, the creators of DanceForms were inspired by an older piece of software called “LifeForms” to create DanceForms. LifeForms was created in the mid-seventies under the direction of Dr Tom Calvert in Vancouver. As explained by Ryman (2004), LifeForms had been created to produce computer animation. In the eighties, the program was developed further to create animation like the one that can be found in TV commercials or even in animated movies.

Ten years later, a choreographer named Merce Cunningham had the idea to use LifeForms to help him in the creation of choreography. That was the beginning of Lifeforms’ platform being used to help choreographers. After having seen this change of use, Rhonda Ryman started to work on LifeForms. She wanted to make this platform more usable for dance educators and professionals. This is how DanceForms was born. One of her goals was to create better dance bodies. She wanted to create both male and female dancers in non-anorexic looking bodies. Today DanceForms is a software program which is used worldwide in the field of dance.

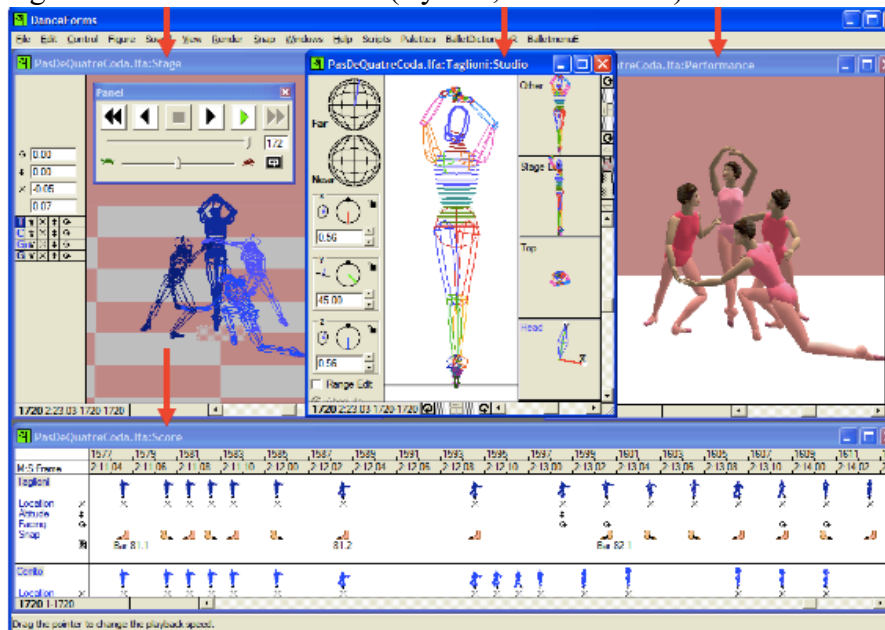
According to Ryman (2004), DanceForms can first be seen as a “post-visualization” software program. In fact, one possibility that DanceForms offers is to record the performance after it has been created. It means teachers or students can watch their performance again after performing.

⁴ <http://www.lifeforms.com/danceforms/main.html>

a) What does DanceForms look like?

This is what the software looks like when the user opens it on his/her computer:

Figure 8: DanceForms screen (Ryman, 2004: slide 3).



As it can be seen in Figure 8, four windows will appear on the computer screen when DanceForms is opened: The “Stage” on the upper-left side, the “Studio” window in the middle, the “Performance” on the upper-right side and the “Score” beneath the three other windows.

As explained by Ryman (2004: slide 3), teachers can “design each dancer’s position in the Studio”, and in the “Stage” window, each dancer has to be correctly placed in relation with all the other dancers. The “Performance” window allows teachers or students to watch the real performance and compare it with the other data they have. The “Score” window gives each dancer’s position. Each dancer has a line where all of his/her positions are represented.

Because Ryman thought that DanceForms might be hard to understand for dancers who have never worked with technology, a user guide is provided. As mentioned by Ryman (2004: slide 4), in this user guide, users can find “a series of exercises that introduce dance-related concepts” such as “step-by-step exercises that introduce ports de bras, allegro, pirouettes, etc.”. Dancers who download DanceForms are also provided with a file called “2 Minute Sound Files”. Inside that folder there are sound files “each containing 2 minutes of metronome beats at slow to quick tempi” (Ryman, 2004: slide 4).

b) DanceForms’ terminology and palettes:

As explained by Ryman (2004: slide 3), to make the software more accessible and more intuitive for dancers, DanceForms uses dancer-friendly terminology. This terminology is available in three different languages: English, Russian and Italian.

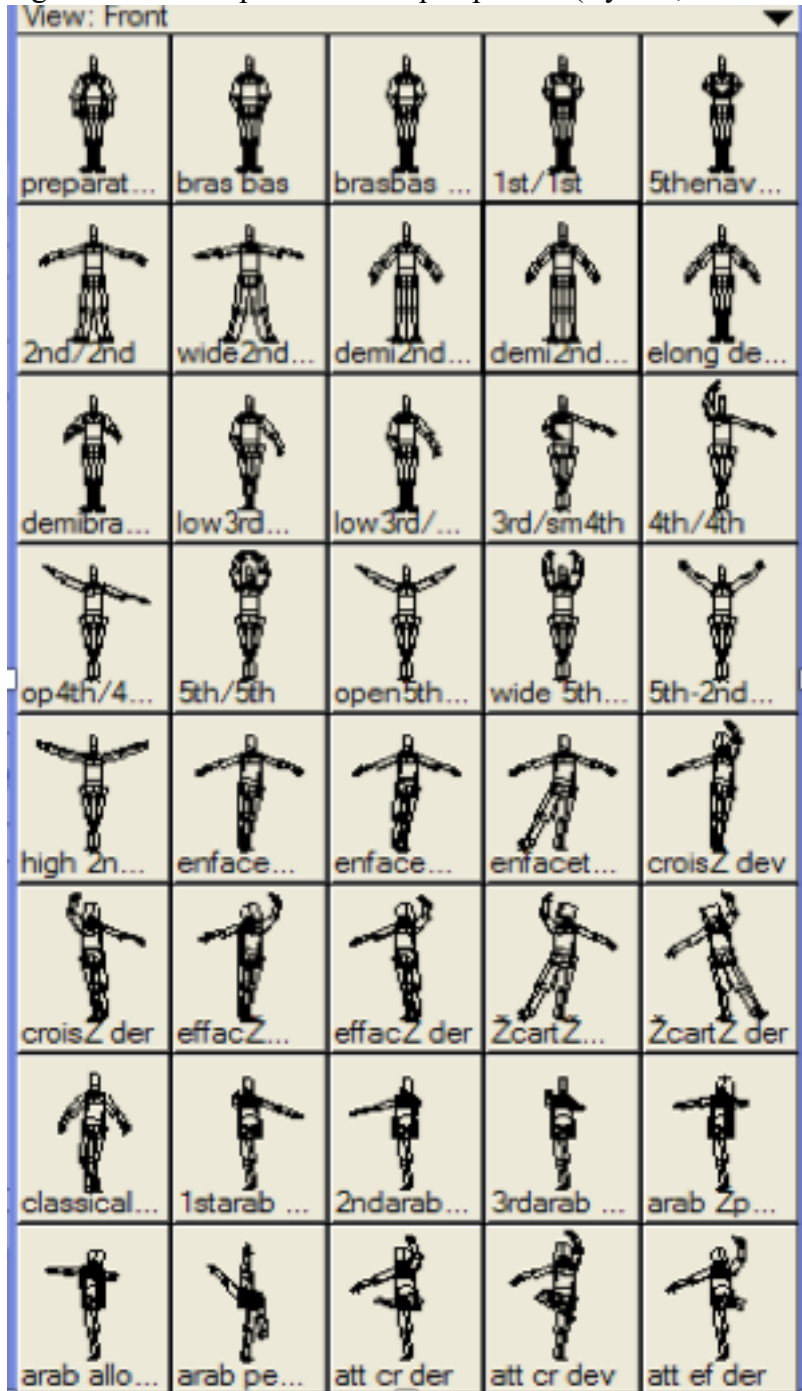
The English dictionary is based on the terminology and stylistic features of the Royal Academy of Dance vocational syllabus.

The Russian dictionary uses Vaganova steps and style.

The Italian dictionary contains selected exercises from the Cecchetti Method including the 8 set ports de bras. (Ryman, 2004: slide 4).

Thanks to these trilingual terminological databases, ballet moves are listed in alphabetical order in the software. For example, if the user is an English dancer and is looking for the movement called “FullContretemps”, he/she will go to the English terminology under the F letter and there he/she will find “FullContretempsE”. Then, to see the movement of a “FullContretempsE”, the student or the teacher just has to click on the item and watch the movement. Ryman adds that the animations used to show these movements were built “from palettes of basic ballet positions”. (Ryman, 2004: slide 5).

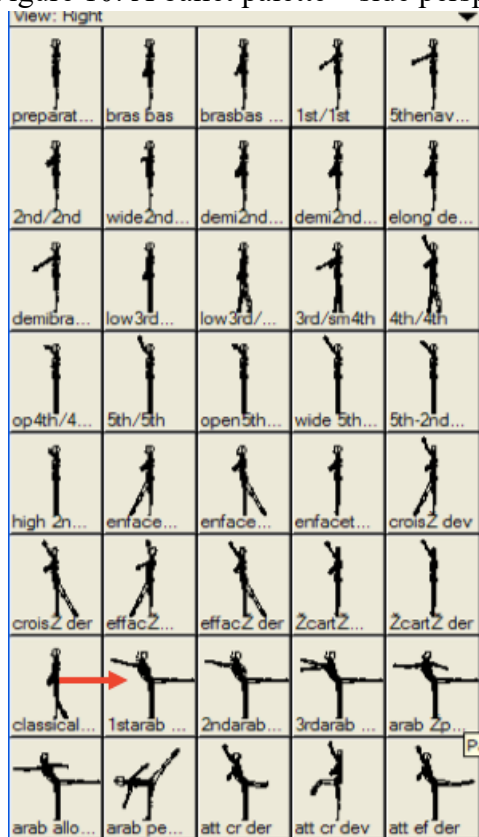
Figure 9: A ballet palette– front perspective (Ryman, 2004: slide 6)



As illustrated in Figure 9, dancers are represented in the front position. In DanceForms, there are 8 palettes like this one. As mentioned by Ryman (2004: slide 6), each of them contains 40 codified positions.

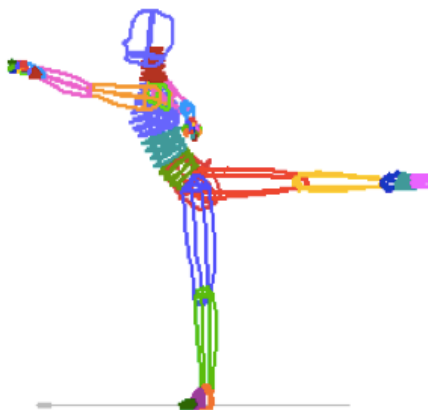
Another advantage of the software is that dancers or teachers can choose to see the palette from the front perspective or from the side perspective:

Figure 10: A ballet palette – side perspective (Ryman, 2004: slide 7)



However, if the user does not like the representation of a movement on the palette, he/she can also modify it. For example, an Arabesque is illustrated on the 7th line of the side-perspective palette. In the Studio window, this is, thus, how a 1st Arabesque will be represented:

Figure 11: A 1st Arabesque as illustrated in the side-perspective palette (Ryman, 2004: slide 8).



If a teacher would like her/his students to perform this 1st Arabesque slightly differently, he/she can modify the position in the Studio: “you may want to lift the leg, open the back arm, and evert the foot slightly for a more professional line” (Ryman, 2004: slide 8).

If the teacher wants these changes, the 1st Arabesque will then look like this in the Studio:

Figure 12: A modified 1st Arabesque (Ryman, 2004: slide 8).



It is important to note that changes made by the user are then saved in the palette.

In conclusion, DanceForms is a choreography software program which allows teachers, students or professionals to create their choreographies from palettes. As explained earlier, the different positions illustrated on the eight available palettes can be modified if the user does not like the way they are represented. The changes made are then saved in the palette and the new position created can be used to create a choreography.

The software allows users to create a position in the “Studio” window and to see the position of all the dancers in relation with other dancers in the “Stage” window. The detailed positions of each dancer are illustrated below in the “Score” window. Finally, the real performance, the live performance can be watched and watched again in the “Performance” window.

This software cannot be used to replace a real teacher through an avatar. It is a software program that helps to create a choreography and to design dancers.

1.2.2. Conclusion

Five different new technologies that are used in the learning and teaching of classical dance and more precisely in ballet were presented in this chapter.

First, the Cave Automatic Virtual Environment (CAVE) which is, as explained earlier, a technology that projects a virtual teacher on a wall. The student can then imitate him/her. Thanks to its different components (e.g., the gesture recognition), this technology is able to compare the movements made by the students and the ones of the virtual teacher. Given the fact that feedback is one of the most important elements of a dance class, the CAVE also provides students with feedback.

In fact, the CAVE system even offers two kinds of feedback: concurrent feedback, which is given while the student is performing and terminal feedback which is given at the end of the performance. With regard to the concurrent feedback given during the performance, it is given in the form of a skeleton and with colours. The red colour meaning the position is erroneous and the blue one meaning the position is 100% correct. CAVE recognises a move that has already been made. This means the CAVE will be able to give the student concurrent feedback as soon as the move is recognised.

The second technology described in this chapter was the Virtual Reality (VR). As mentioned earlier, this technology is very similar to the CAVE. Indeed, a virtual teacher is also projected on a wall and students can try to imitate him/her. One difference, however, is that to be able to use this technology and thus receive feedback, users have to wear a capture suit.

One advantage of the VR is that the virtual teacher's performance can be slowed down by the student if it is too fast for him/her. Another one is that this technology offers three kinds of feedback: immediate feedback (during the performance), a score report (given at the end of the performance) and a slow-motion replay.

Both the CAVE and the VR are technologies that aimed at replacing a "real" teacher and that seek to give students the opportunity to practice entirely on their own.

The third technology presented in this chapter was the VideoTrace system. As explained above, it is a digital annotation tool that allows users to capture videos and then to write notes on them. The goal is for teachers and students to be able to watch the video again and to not have to remember every detail of the live performance. Students can also stop the video or use the finger tool to show something on the screen.

DiViDU was the fourth technology described. Like the VR system, it allows students or teachers to record their performance. It is a video-based learning environment which aims at helping students in the writing of assignments. Being able to watch and edit their performance can help students to find a starting point to reflect on their work.

Finally, the last technology was a choreography software program called "DanceForms". DanceForms is made up of different components. The first one is called the "Studio", which is the place where choreographers or teachers can design the dancers. The "Stage" is where users can see all the dancers placed in relation with all the other dancers. There is also a spot that shows the position of each dancer, which is called the "Score". The window on DanceForms' screen where users can follow the live performance of dancers is called the "Performance" window.

To create choreography, users have eight different palettes of positions at their disposal, which they can modify if they do not meet their criteria. The changes are then saved in the palettes.

2. Chapter two: Belgian ballet students' opinion on the technologies presented in the first chapter

Chapter two is devoted to the opinions of three Belgian students who studied classical dance at the Royal School of Antwerp and whose sole purpose is to make it as professional dancers. The information collected in this chapter comes from individual interviews I conducted with Alexandre, Alysson and Cynthia. The chapter aims to answer the following question: Would these technologies be welcomed in Belgian dance schools according to the students themselves? Before the students were interviewed, a PowerPoint presentation, that I created beforehand, was used to explain the five new technologies under study. I presented the technologies to them one by one and checked that they had understood everything, then I asked them several questions designed to explore their opinions on them. The interviewing process is described in the chapter and the students' opinions are discussed.

2.1. Exploring the opinion of Belgian students about the new technologies outlined in Chapter 1: Data and methods

One of the aims of this dissertation was to explore Belgian students' opinion on the new technologies that are used when teaching and learning ballet. To do so, I adopted a qualitative approach and set out to conduct individual interviews with two former students and one current student of the Royal Ballet School of Antwerp⁵. I decided to contact students from this school as it is an internationally recognised school that prepares students for a professional career in ballet. It may therefore not be unreasonable to assume that the teachers at the school are familiar with cutting-edge technology in their field and may use or at least mention it in their teaching and coaching activities.

Finding students who would agree to take part in my investigation was rather challenging. I first visited the Facebook page of the school to find former students who obtained their degree in 2020 or students who will obtain their degree next year. I selected ten of them, five girls and five boys, according to the picture on the Facebook's page. I wrote to the ten of them and only three positively answered. In fact, students were having a hard time because of the Covid-19 pandemic measures: they were mostly alone in their studio or their apartment and had to follow their classes online through the Zoom platform. Staying longer on the computer to talk with me was understandably not the greatest free time after a hard day of online classes. Fortunately, three students agreed to take part in my study, and I am extremely grateful to them: Alexandre, Alysson and Cynthia⁶. Alexandre is Belgian and was 18 years old at the time of the interview but is 19 years old today. He spent 6 years at the Royal Ballet School of Antwerp, and he is now dancing in a ballet company in Nuremberg, Germany. Alysson is Belgian and she is turning 17 in May. She has been studying for five years at the Royal Ballet School of Antwerp and after she graduates, she would like to enter a school that trains dancers to join a company. Cynthia is Belgian and is 17. She spent six years at the Royal School of Antwerp, and she is now preparing to enter the Royal Conservatoire of Antwerp.

As explained in Chapter 1, the new technologies under investigation in this dissertation are mostly used in Canada or in the United States of America. However, to collect Belgian students' opinion about these new technologies, they first needed to perfectly understand how

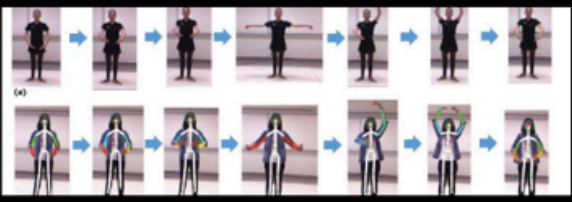
⁵ <https://www.stedelijkonderwijs.be/royalballetschoolantwerp>

⁶ Not the participants' real names.

the technologies work. In order to fulfil this purpose, I first created a PowerPoint presentation that explained the technologies one by one. This PowerPoint presentation can be found in **Appendix 1** and, as an example, the slides used for the CAVE environment are illustrated in Figure 13 below. After having presented one technology, I would stop and ask the student if he/ she had any questions about something he/she might not have understood.

Cynthia's and Alysson's interviews were both held in English. Alexandre's interview was held in French, but I translated the student's full answers and the passages included below from French into English. The students' full answers can be found in **Appendix 2**.

Figure 13: Slides created for the CAVE environment in the PowerPoint presentation used in the individual interviews carried out with the three students.

1. CAVE - the machine first has to detect all the different movements and compare them with the movements of the teacher projected on the wall. - students have the possibility to receive feedback after but also during the performance. - When feedback is provided during the performance, it is called "concurrent feedback" and when it is given after the performance, it is called "terminal feedback".	 FEEDBACK IN FORM OF SKELETON
ADVANTAGES 01 Different kinds of feedback 02 Skeleton and colour table are used to help the student visualise easily where he did a mistake 03 Students can work whenever they want because they do not need a "real" teacher 04 CAVE recognises a move as soon as you have done it one time => CAVE will be able to give the student concurrent feedback as soon as the move is recognised.	DISADVANTAGES CAVE environment shows some difficulties to capture the different movements that involve bending backward. Students have to face the camera to receive their feedback
QUESTIONS - What is your general feeling about this CAVE environment? - In your opinion, is this CAVE appropriate for dance students? - What do you think about the feedback? (2 types of feedback: during the performance and after the performance/In colour) - According to you, is this feedback better than the one given by a teacher during the class?	QUESTIONS - Have you already been in a CAVE environment? If yes, on which occasion? - Would you like to train in a CAVE like this one? Why or why not? - Do you think that the CAVE environment is a good way to communicate? Is the communication between the virtual teacher and yourself a good one in this environment? Why/why not? - Do you have any comments to add?

After checking that they had fully understood how the technology works, I would ask them the questions I had prepared for the technology. The series of questions immediately followed the presentation of the technology so that the student would remember everything I had just presented as accurately as possible. All the questions asked were open-ended questions that encouraged the student to explain his/her opinion using as many details as possible. Table 1 includes the questions that I asked about each of the technologies presented. As can be seen

from the table, the questions mainly aimed at collecting students' opinions on these new technologies, at finding if they would like to work with/in these technologies and why or why not. I did not draw inspiration from any particular existing questions or interviews. In creating the questions, I really tried to put myself in the place of the dance student. I asked the questions that seemed to me to be the most useful in order to be able to find an answer to the research question of whether or not the five new technologies in chapter 1 would be welcomed in Belgian dance schools according to the students themselves, and to find out what advantages and disadvantages of such technologies were identified by these dancers.

Table 1

CAVE	- What is your general feeling about this CAVE environment? - In your opinion, is this CAVE appropriate for dance students? - What do you think about the feedback? (2 types of feedback: during the performance and after the performance/In colour) - According to you, is this feedback better than the one given by a teacher during the class? - Have you already been in a CAVE environment? If yes, on which occasion? - Would you like to train in a CAVE like this one? Why/why not? - Do you think that the CAVE environment is a good way to communicate? Is the communication between the virtual teacher and yourself a good one in this environment? Why/why not? - Do you have any comments to add?
VR	- Have you ever used a VR? If so, was it in a dance context? - What is your general feeling about this VR?

	- In your opinion, is this VR appropriate for dance students? - o To be alone? - o What about the space? - What do you think about the feedback? - o 3 types of feedback - o In colour - According to you, is this feedback better than the one given by a teacher during the class? - Do you think the VR is a good way of communicating with the student? - Would you like to train in a VR like this one? Why/why not? - Do you have any comments to add on this VR?
VideoTrace	- Have you ever used an annotation tool? If so, was it in a dance context? - What is your general feeling about this VideoTrace? - Do you like the possibility of watching again and again your performance after having done it? Why/why not? - Do you think it could be useful to watch the performance again? Do you think it could help you to detect where you have made a mistake and why? - Do you think it would be good for the teacher to focus entirely on your performance and watch the video later to give you detailed feedback? Or do you prefer to receive feedback about technique, emotion, musicality at once during the class? - Do you think this annotation tool is an advantage in the way of

	communicating between the teacher and the student? Why/why not? - If I were offering an annotation tool to your school, would you use it? Why/why not?
DiViDU	- Did you have to write assessments about your work during your dance studies? - If you had to write such assessments, would you have liked to have a technology like DiViDU? Why/why not? - If you did not have to write such assessments, have you ever used something like this DiViDU application in another context? - Do you think DiViDU could help students to write reflection assessments on their works? Why/why not? - Do you think this kind of annotation tool gives the opportunity to students and to teachers to communicate better than if it was only an oral communication? - Do you agree with the fact that if dance students have the possibility to watch their performance again it can help them to better understand the feedback?
DanceForms	- What is your general feeling about DanceForms? Do you like it? Why/why not? - Do you think it is great to be able to compare the real performance you see in the “Performance window” with the “Stage Window” where you can see the correct place of each student? - Do you think it could help you to see where you have to be placed and how

	in relation with other students (in the Stage window) before starting to dance? Why/why not? - Do you like the possibility to create your own movements thanks to DanceForms? (the possibility to change a position from the palette and then save it with your changes, like the first Arabesque I showed you) - If I were offering DanceForms software to your school, would you use it? Why/why not? - Would you like to add any comments?
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Unfortunately, because of Covid-19, it was impossible for me to hold face-to-face interviews with the students. Instead, the interviews were held on Messenger so I could easily share my screen with the participants. However, when I was asking them the questions, I would stop sharing my screen to have a better face-to-face interaction. From the beginning I knew I wanted to conduct interviews for this part of my study because I really wanted to see the expression of the students while talking. This was only possible with interviews. Moreover, interviews gave me the possibility to explain again something a student might not have understood. Thanks to interviews I was sure the participants had all the necessary information to answer all of my questions. These interviews were one-on-one, so I was able to focus on only one student at a time. This made it possible for me to gain a more in-depth understanding of participants' perceptions, motivations and emotions.

Each interview was approximately one hour and fifteen minutes long. It is important to note that if a student was becoming tired before the end, we would stop and continue another day. That is for example what happened with Alexandre. We stopped before the last technology called DanceForms, and we finished another day. All the interviews were recorded using my phone's recorder.

I tried to take notes during the interview, but some parts were transcribed after the meeting. An in-depth content analysis was conducted to identify the commonalities and differences between the answers given by the four different participants. The participants' full answers to the questions asked can be found in **Appendix 2**.

2.2. Exploring the opinion of Belgian students about the new technologies outlined in Chapter 1: Findings

This section discusses the answers given by the participants during the interviews I conducted to explore what they think about the new technologies under investigation here. The discussion is divided into five parts, one per technology.

It clearly emerges from the interviews that the participants, who trained within an internationally renowned professional ballet school, were not familiar with any of the technologies under investigation in this dissertation, which suggests that the technologies are not widely used in Belgium. Most of the time, the three students understood easily how the new technologies work, thanks to the PowerPoint presentation I prepared beforehand, but most of the time, asked me to repeat how the feedback was given. This suggests that feedback is, as it can be expected, a crucial necessity for the dancer. DanceForms, the last technology under investigation in this dissertation, was the one that has been the most complex to understand for the students. They found this software program very tricky and did not understand easily what its purpose was and how to use it.

2.2.1. CAVE

When discussing the CAVE environment, all the students agreed that dancers need to bring something personal to the movement. They said that they need that freedom to become who they are as dancers. For example, Alysson stressed that

“normally you are allowed some freedom when you dance in the studio but here you have no freedom at all”,

while Alexandre mentioned that

“CAVE is too technical and does not give the student the opportunity to create or bring his/her personality to the movement”.

Cynthia even said that

“if a student does exactly the same as the teacher, every dancer will dance the same way”.

They all regret that this first technology is far too demanding in terms of the way feedback is given. Dancers need, according to the interviewees, to integrate their personality, their style into their performance and this is impossible in the CAVE environment as it would be interpreted as a mistake and not as their own personality.

The fact that the teacher is an avatar is also something that bothers the students interviewed. Even if Alysson says that CAVE is a good way to work during their free time, she adds that she will always prefer to work with real students and real teachers. Alexandre shares her opinion:

“I do not like the idea of working alone. And I really prefer to work ‘live’ with other students. Even using Zoom seems better than to work in the CAVE environment, because, at least, we see ‘real’ people working at the same time as we do”.

With regard to the different kinds of feedback (*i.e.*, the one given during the performance called “concurrent feedback” and the one given at the end of the performance called “terminal feedback”), Alexandre believes the technology could be beneficial because any errors can be seen very fast. However, Alysson says that the feedback with colours is very strict and thus does not give students freedom of movement. If they had to train in a CAVE, Alexandre and Cynthia agree that the feedback given during the performance is the best because dancers can change an error immediately. Alysson disagrees and stresses that having to keep watching the skeleton is not handy because you still have to continue dancing. She believes it would be too disturbing. There is consensus that the feedback given by a real teacher will always be better than the feedback given by the CAVE. Alysson points out that the CAVE’s feedback does not take the musicality and expressions of the dancers into consideration: *“CAVE gives feedback about the technique and about your body. It means there is no feedback for everything around the musicality and expressions”*. Cynthia adds that the CAVE just tells you your error but does not explain to you how to solve it and how to improve yourself. Alexandre even insists saying *“I prefer what is real, and if it is not possible, for example because of Covid-19, I would not like to receive feedback from CAVE because it is as if I was with a robot”*. Finally, none of the students interviewed thinks that CAVE is a good way to communicate. According to them, it is not real communication because you are not with a real person.

In short, none of the participants would like to train in the CAVE and the disadvantages appear to far outweigh any possible advantage.

2.2.2. VR

VR did not make a good impression either. According to all of the interviewees, the VR is even worse than the CAVE because of the capture suit or the glasses that dancers need to wear to be able to receive feedback:

“The fact that we have to wear a capture suit is a big disadvantage. It is, I suppose, not comfortable. In every day’s class, it is really important that our teacher can see our muscles, so we have to wear very light clothes. So, the capture suit would not be good at all” (Alysson).

“It must be very disturbing to have to wear glasses or the capture suit because it is as if we were no longer in the real world. The eyes are very important when you dance because you have to see where you position yourself. With the glasses I would have the feeling that I am lost” (Alexandre).

“It is actually the same concept as the CAVE but in worse because of the capture suit” (Cynthia).

Alysson is, however, of the opinion that VR is more practical than the CAVE because with the VR, you only need a wall to project the avatar teacher and you do not need to be in the CAVE to train.

Regarding the three kinds of feedback provided by the VR (namely, the “immediate feedback” which is given while practising, the “score report” which is general feedback given at the end of the performance and the “slow motion replay” which is a replay of the performance which allows the student to see his/her errors), all three participants doubt the need for three feedbacks.

For example, Alysson says that she asks herself “*if three kinds of feedback are not a bit too much*”, while Alexandre says that he does not think that three different kinds of feedback are necessary for a student. There is also consensus that the fact of being represented as cylinders is not practical or helpful. They all insist that they would need more details to fully understand the feedback and to be able to improve themselves:

“feedback in form of cylinders is not good, I would appreciate more details. Here we only receive a shape of something and that is not sufficient at all because we need to see the muscles too. Without that, the dance can be completely different” (Alysson);

“the feedback given in cylinders is a big disadvantage because sometimes teachers will tell you to use a muscle somewhere and with the cylinders you cannot see the muscles” (Cynthia);

“being represented as cylinders is not good because it is not representing the human body in detail and correctly. In our feet alone, there are so many things we have to position correctly” (Alexandre).

Moreover, as with the CAVE, the VR cannot give feedback on the emotion or musicality and that is a real problem for the dancers:

“the three kinds of feedback only focus on the technique. You will not receive any feedback on the emotions you convey or the way you breathe, which for me, is very important, as much as the technique” (Alexandre).

Again, none of them think that VR is a good way of communicating because it is not human and there is not any real person to talk to. Cynthia says that “*it is not human like. I want a real person. Sometimes I am already scared to ask a teacher, so it is even worse with a machine*”.

As a conclusion, not a single participant would be ready to train with the VR on a daily basis.

2.2.3. VideoTrace

VideoTrace was welcomed more warmly. In fact, Alexandre and Alysson both said they like it, although they both also added that in a video the expressions and emotions are not visible anymore:

“I like it. I think it is really interesting to film and then have the possibility to annotate directly the video we have taken. I also like the opportunity to slow down or even to stop the video. But as I already said, I will always prefer having feedback of someone. Because even when you watch the video the emotions won’t be visible anymore. However, emotions are really important for a dancer” (Alexandre);

“I have experienced many times that teachers do not remember something. So, it might really help teachers to focus better. But if the teacher uses the video to give feedback, it means that, again, he/she will not be able to give feedback about the expressions or the musicality. I prefer to receive feedback about everything in class because details are important” (Alysson).

All three participants reported that it was easier and faster to film themselves with their phones. For instance, here is the opinion of Cynthia:

“I think we do that a lot even without VideoTrace because we film ourselves a lot and then send the video to the teacher, or we watch it together. But usually, I film myself with my phone. I think we have more “work” to do when working with VideoTrace because we have to write things when we could simply be talking together. It is thus easier and faster with our phone”.

They have actually filmed themselves a lot since the Covid-19 pandemic started because they all feel that watching their performance helps them to better understand their mistakes and to start to work on them:

“Yes, it is very useful to be able to analyse our performance. It is a nice way to improve ourselves. I like to film myself, and this year, because I was alone in my house, I used to film me a lot” (Alysson);

“During the Coronavirus pandemic, I really learned to do that, and it did help me a lot. I really like to film myself because often teachers say things that we have to change but we do not understand what we have done wrong and thanks to the video we finally see, and we can start working on it” (Cynthia).

They also all agree that watching their performance helps them to improve their choreography because while watching their performance, they can easily notice where they have made errors for example. However, they would not want to wait until the teacher watches the video to give detailed feedback. For example, here is what Alexandre thinks:

“It could be interesting that the teacher just focuses on live emotions but does not deprive himself/herself of giving technical feedback either. The teacher also needs to say what technical problems he/she sees at the moment. But it is interesting for him to watch the video afterwards to see things he would not have seen and thus be able to give more feedback”.

Cynthia is even more adamant. She says the following:

“If you are a good teacher, you are already focusing entirely on the performance even if you just forget something sometimes. Usually, they give a correction, and you correct it immediately, then another, etc”.

They say they prefer to receive feedback about the technique but also about the expression and musicality during the class, while they need to receive a general feedback about everything during the performance: *“We need to receive feedback about the technique and about the expression and musicality also during class” (Alysson).* In conclusion, if these three students had the possibility to use VideoTrace, they would use it, even if they still need feedback from their teacher during their performance too, because it is helpful to be able to annotate the video and to watch one’s performance to be able to catch the errors and improve their way of dancing.

2.2.4. DiViDU

Alexandre, Alysson and Cynthia had to write self-evaluation reports to be assessed during their studies and, according to Alexandre and Cynthia, having the possibility to use DiViDU at that time would have helped them to start thinking about their work:

“It could have been useful because we get some questions and so we do not have to dig into our memory -. It is a good way to start thinking. While reflecting you know yourself better because you see yourself and you understand something. But after, you need to be able to know yourself and to feel when you do something wrong without having to watch the video again” (Cynthia).

Alysson does not share this opinion because she says that reflecting on her work does not help her to improve her skills. She adds that she can more easily film herself with her smartphone:

“reflecting on my work does not help me. Now if it was really an obligation, yes why not but the thing is that with our cell phone we can also record and film. So, it would be great maybe to have access to DiViDU on the phone”.

That said, Alysson still agrees with Alexandre and Cynthia that DiViDU can help students to write reflection assessments even if it does not help her personally. According to Alexandre, it is sometimes very hard to remember every detail of a performance and so DiViDU would help him to remember more and better: *“It is really hard to remember every details of our performance. Being able to watch it again give us the opportunity to reflect on it”.* Alysson believes that DiViDU might be very helpful for younger students but not for her because she does not need to watch her performance after having done it. Cynthia stresses that it is also highly important to be able to correct yourself without a video and she suggests that, for the first written self-assessment, students should be able to have the help of DiViDU but for the next ones, students should be able to only “listen” to their bodies. Here is what she says:

“I think it is important to be able to reflect on you work and correct yourself without a video too. So, a nice idea could be to have to write assessments two times a year, first time with the help of DiViDU and second time without so you learn to feel yourself”.

Regarding the way teachers and students can communicate through DiViDU, Alexandre thinks that a self-assessment gives the student the opportunity to really think, to not give an answer directly. According to him, it is a deeper kind of communication with the teacher because he has a lot of time to reflect on his work, to find the correct words and to think about what he is going to say and how. It is not a direct communication where you say what you think very quickly without taking the time to really reflect on what you are going to say. Alysson also highlights the following advantages of the reflection work made possible by DiViDU. She says:

“According to me it [this way of communicating] is not perfect or ideal, but it is still something. For a teacher it is nice to see if students can understand their difficulties. It is a nice way to see if students understand their mistakes. So, it is still a good interaction but not as good as real talking”.

Cynthia, however, thinks that the reflection work is more a way of communicating with yourself and that it is less helpful than real communication with the teacher: *“It would never be better than the oral communication because it is not real. It is more so a communication with yourself*

actually". All of them agree that being able to watch their performance on DiViDU before starting to reflect on it is very helpful because it gives them the opportunity to see their mistakes and to understand what the teacher said:

"When you just ended a performance sometimes you are still "on it" and not ready to understand every correction that the teacher is giving you. The possibility to watch your performance gives you the opportunity to understand what the teacher told you" (Alexandre);

"As said before, you think you have done something good but when you watch the video you notice it wasn't as good as you thought" (Cynthia).

De facto, students would agree to use DiViDU because it offers them the opportunity to watch their performance before reflecting on it, but all mention that this can also be done by filming the performance with their smartphones. As a result, this new technology is not considered as a very helpful nor promising.

2.2.5. DanceForms

All three participants have a similar general feeling about DanceForms. They feel that it seems very complicated to use, that there seems to be too many details to fully understand it and that it should take a long time to create a choreography with it. Here is for instance what Alysson and Cynthia think about it:

"It is very nice to create a choreography like that. I really appreciate that the bodies are not anorexic here. However, it is very specific, and the software has a lot of details. It is very nice to create a choreography but maybe there are too many details to fully understand it. I think it could really help teachers to create a group piece when they are alone at home, because, today with the Covid-19 situation, I experienced some teachers saying they did not know how to create a piece alone at home" (Alysson);

"I think creating a choreography with that software takes a long time. It is great that you can change the movements but again if you change them, it takes longer to create the choreography. Moreover, I think choreographers would not like to just pick things from a palette, they want to create. And if they were only picking up movements from the palettes, all the choreographies would be the same in the end, just with the movements in a different order. Because the movements in ballet are really precise and strict that could work but for contemporary it is completely impossible" (Cynthia).

There is also consensus that being able to compare the real performance in the *Performance Window* and the correct places of each dancers in the *Stage Window* is great. However, as pointed out by Alexandre, this could actually easily be done by filming the performance with their smartphones: *"I think it is nice to get an overall view of the choreography and the piece. But you can compare your performance and the teacher's one only by filming everything on your phone"*. Cynthia even expresses that students might be doing better than what was planned in the *Stage Window*: *"I think this is good and I even think that teachers might be surprised to see that students actually perform better than what was planned in the Stage window"*.

Cynthia and Alysson both agree that being able to see where and how dancers need to be placed in relation with the other students in the *Stage Window* is very useful:

“[It is very helpful] because placement sometimes is very tricky, and it is possible that we do not always understand what the teacher wants from us. So, it would be very nice to understand easily how we should be placed, and I think it could be a good time-saver” (Alysson);

“Often teachers are saying ‘that is the vision I have for that’ and us, dancers, we really do not understand what the teacher wants from us. So, that might be a good time-saver mainly for classes where there are a lot of dancers and thus a lot of figures” (Cynthia).

They both stressed that it saves time because students often do not really understand what the teacher wants from them and being able to see what the teacher has in mind would definitely help. By contrast, Alexandre says that he would not like to learn a choreography like that; he needs contact:

“Personally, I would not like to learn a choreography like that. For me the traditional way is much better. As I already said, all these technologies do not have what is the most important to us, dancers: contact and having a real teacher”.

All three participants see the possibility to change a move from the various palettes as a great opportunity. Cynthia even adds that she would change every move because, according to her, if dancers or choreographers do not change a move, it will never be their own movement and thus the choreography will never be their piece. If she was given the opportunity, Alysson would like to try DanceForms. In contrast, Cynthia and Alexandre would not. Cynthia concludes with a very strong opinion: *“I would never go to see a performance that was made by the software. Or I would go only to see if they changed the movements”.*

2.2.6. Conclusion

The conclusion can be drawn that none of these five new technologies would be fully appreciated by Belgian students, according to Alexandre, Cynthia and Alysson. Even if they had the possibility to use them, they would refuse, except maybe for the VideoTrace, because, as they explained several times during the interview, dance students will always need to have real contact with the teacher. DiViDU was the other technology for which some advantages were found, nevertheless, the three interviewed students agree with the fact that a smartphone could be used to replace the advantage that DiViDU is offering, namely the possibility to film their performance and watch it to help them in the beginning of their reflecting process. Alexandre, Alysson and Cynthia all agree that, according to them, students need to be able to ask questions to a real teacher, to get feedback and help to improve their way of dancing. A technology that just shows the mistake without any comments does not help them. They need to obtain help; their muscles sometimes need to be touched by the teacher in order to correct that mistake. They need a real teacher to become great dancers and to find their own style without it being seen as a mistake. As they are today, these new technologies are not yet ready to be used by Belgian student dancer

3. Chapter three: The impact of Covid-19

This chapter discusses the impact that the Covid-19 pandemic has had and continues to have on the world of education, and more specifically on the world of classical dance education.

A first section illustrates the major consequences that this pandemic has had around the world and also analyses the sanitary measures that have been formulated and applied in order to limit the spread of the virus as much as possible.

The second part focuses on the opinions of ballet students (the same three students who were interviewed in the second chapter) who experienced the pandemic. Through a questionnaire, they will explain what the hardest thing for them was, the solutions they found to continue training, the emotions they went through. In order to gain a broader understanding of the impact of the pandemic and the lockdown on dance education, I also contacted a dance teacher from Canada who had to find solutions to adapt her classes to the health measures imposed, as well as the director of a renowned dance school in Belgium.

Thanks to the opinions and answers of these participants, an answer to the second research question: "what were the most negative and positive consequences of the Covid-19 pandemic and lockdown for students, a teacher and a director" could be found.

3.1. Consequences of the pandemic for the teaching and learning of ballet and measures taken to try to avoid the spread of the virus SARS-CoV-2 in dance schools

As is clear from media coverage, Covid-19 has completely changed the way students get access to their studies. The large majority of courses went from face-to-face to distance courses through online platforms like Teams or Zoom.

Ballet schools also had to adapt and to convert all the courses they offer to virtual, online or hybrid lessons. According to Tormey (2020), "social distancing and quarantine are contrary to the nature of dance". Even if it is contrary to the concept of classical dancing, ballet schools had to adopt these rules too. As a result, they went online. Teachers as well as students were facing, and are still facing, some difficulties, however. Suzanne Ostersmith (2020) explains why teaching online a real challenge is:

Students are used to following instructors' backs as they demonstrate in the mirror and watch students assess their learning. With Zoom, it is more normal to face the students; but then, students ask the teachers to turn away. But if the teachers turn away, they can't see the students to assess learning. It's challenging to knowing which is the 'right' or 'left'.

As mentioned by Ritzel (2020), some teachers were invited to sign up for virtual help desk appointments to better understand how to work on Zoom.

However, it is not the only problem that teachers teaching on Zoom are facing. For example, Ritzel (2020) mentions the problem with musicians. Teachers do not know how to include musicians in online classes. Fortunately, some musicians have agreed to give teachers music for free.

As pointed out by Giles (2020), students and teachers first thought that the situation would be back to normal by autumn 2020. But because the situation was far from recovering, new rules and long-term strategies needed to be taken. As explained by UNESCO in its issue note n°2.1 of April 2020⁷,

distance learning strategies in response to covid-19 school closures are a set of sector - wide measures taken by government agencies and partners to continue students' curriculum-based studies and other regular educational activities when schools and other physical educational institutions are closed.

The class format was going to vary widely. The first question teachers had to answer was in fact about that format: will the class be given in person, online or will it be hybrid? As reported by Giles (2020), some colleges like Pace University in New-York are leaving the choice up to each student. However, the hybrid model is chosen most of the time. Jared Redick, interim dean of dance at UNCSA (in Giles 2020), explains that with that hybrid model, “students will be divided into two or three smaller cohorts: Part of the class will be in one studio with the instructor, while the other will be in a different studio taking the class via Zoom”. Because classes are usually held inside a studio, wearing a mask is mandatory and tape markers are used on the floor to ensure social distancing. Students are also asked to wear socks rather than being barefoot. Giles (2020) adds that “classes might move outside” because virus particles disperse more quickly in open air.

Teachers also needed to find solutions to still be able to provide students with accurate feedback. Giles (2020) reports that for the pre-recorded classes (asynchronous ones), students will have to film themselves while performing and then send the video to their teachers to receive feedback. With regard to synchronous classes, there are different possibilities. Rhonda Miller (in Giles 2020), director of the commercial dance program at the Pace University, explains that during her lesson she “will have groups of three or four students perform the combination at a time and ask the rest to turn off their cameras” so that she can provide these students with feedback.

However, it is important to mention that to participate in online classes students need to have access to a computer or a tablet. As pointed out by Dr Lise Uytterhoeven, director of Dance Studies of London Contemporary Dance School (2020), “some students did not have access to a reliable laptop or tablet through which to access the online learning. The School sent laptops from the stock in our audio-visual room to these students' homes”. In this case, the school helped the students in need. It is noteworthy that, as explained by UNESCO in its issue note n°2.1 of April 2020, because of gender inequality, some girls do not have access to the family computer or to the internet. UNESCO says that “policies and measures should be taken to support gender-equitable access to household learning devices, and flexible programme scheduling and learning structures should be designed with a focus on being more inclusive to female students in difficult circumstances”.

However, it is not the only suggestion by UNESCO to provide a Covid-19 education response. In fact, UNESCO explains that “the effectiveness of distance learning strategies is conditioned by levels of preparedness from various perspectives”. For instance, is the country technologically ready to provide remote courses to all learners? Are teachers ready and prepared

⁷ <https://unesdoc.unesco.org/ark:/48223/pf0000373305>

to create online classes? Are teachers ready to monitor distance learning processes and to achieve long-term goals?

UNESCO also stresses that providing “regular supervision can help reduce the sense of distance and disengagement” or the fact that “regular (daily or 2-3 times a week) formative assessments have proved an effective means to monitor learning processes and to inform the learner on their progress”. It can thus be concluded that feedback is even more essential for dancers when they are practising at home.

Another problem that students may be facing during this Covid-19 pandemic is, as explained by UNESCO (issue note n°2.1 of April 2020), the feeling of loneliness and potential depression. UNESCO thus also suggests teachers should “mobilize available tools to ensure regular human interaction and enhance human connection to address the senses of loneliness, and provide social care assistance to address possible psychosocial challenges that students may face when they are isolated or bereaved”. According to the National Dance Education Organization⁸ (NDEO) (2020), teachers need to keep students at the centre. Teachers have to regularly check what students need and they have to adjust to the new way of teaching. One possibility, according to the NDEO, is for teachers to deepen personal connection with students, for example, by increasing focus on student reflection. If student reflection was to become more and more important during online course, the use of DiViDU, one of the new technologies presented above, could be helpful.

Moreover, according to the NDEO, it is of paramount importance that teachers realise that students are not coming from the same background: “teachers should realize that students may not have access to technology or equipment needed for successful online learning, including devices to share among family members, access to high speed internet, and private space within the home for learning”, teachers should “realize that students may be taking on new responsibilities at home, such as caring for siblings”, teachers should “realize that students may be uncomfortable sharing their home space via videos”. To continue to work properly, it is essential, according to the NDEO, that teachers develop and maintain the culture of enthusiasm. One powerful NDEO suggestion to teachers is the following one: “shift our collective mindset to see this as our ‘moment’ to change education policy and practice”.

The Covid-19 pandemic and the lockdown have also less-known consequences for both students and dancers. According to the United Nations (73rd policy brief, 2020), Covid-19 also has an impact on physical activity and well-being: “under such conditions, many tend to be less physically active, have longer screen time, irregular sleep patterns as well as worse diets, resulting in weight gain and loss of physical fitness”, which is for dancers, a very dangerous consequence. Fortunately for dancers who want to keep training outside the scope of classes and for students that need to relieve pressure through sports, Bas et al. (2020) remind us that there are a lot of opportunities for online sport lessons. In fact, there are a lot of different possibilities for dancers to train online. For instance, Stahl (2020) listed some online courses accessible for ballet dancers like the “Veyette Virtual Ballet School” which was launched by Miami City Ballet principal soloist Lauren Fadeley and her husband. As explained by Stahl (2020), they offer one-on-one lessons via Skype and the hourly cost of a private lesson is 100\$. Applications have also been created to help dancers to train while receiving feedback too. One of these applications is called “1on1” and was created by Svetlana Lunkina. As Stahl (2020) explained it, this application “records your movement—such as the position of your body in

⁸ https://www.maine.gov/doe/sites/maine.gov.doefiles/inline-files/Teaching_Dance_in_Fall_2020_-_Final_7-1-20.pdf

space, speed, angles, angular velocity—and compares it to a professional ballet dancer executing the same exercises, to help you analyze and correct your work”.

Even if teaching online tends to be very challenging for teachers, some of them still find advantages in this way of teaching. In fact, Ms Caruso, the chairwoman of the performing Arts department and director of the dance program at La Roche University (Pennsylvania) (in Bauknecht, 2020), says that, thanks to her working on Zoom, she can see all of her students at the same time. She adds that when she walks through the studio there are always a couple of students, she cannot see directly, and she thinks of it as a disadvantage of working on-site. She adds that working on Zoom makes it very easy to give corrections.

But as it can be easily understood, teaching ballet classes online cannot go on forever. Long-term measures to respect social distancing and to try reducing the spread of the virus in the studios as much as possible have been discussed and implemented. Each country is taking its own decisions in regard to the resumption of face-to-face classes. But it seems that all countries tend to take similar decisions. For example, in Australia, as explained in an article published by their Government⁹, the Dance and Physical Performing Arts Industry has created a Covid-19 Safe Plan (DPPA). The measures taken in the DPPA can be easily found in all other dance schools that are doing their utmost to offer face-to-face classes again. The basic rules are that dancers need to arrive already dressed and ready for the class or the rehearsals, so that they do not use the changing rooms nor the shower amenities. The rule is “get in, dance, get out”. There has to be separate entry and exit points and arrows to coordinate the flow. It is also highly important that high-touch points and common use equipment are disinfected between each activity. The DPPA also requires a post at the entrance of the building where the temperature of the students must be taken. The DPPA says that:

a person presenting with a borderline temperature of 37.3°C or 37.4°C should be checked for signs or symptoms of Covid-19, should rest 10 minutes in a segregated area then have their temperature re-checked. If the temperature remains borderline, they should be considered as having an elevated temperature,

and thus, be sent home. In the document called “Obligatory conditions and Guidelines for Dance Schools¹⁰” from the Maltese Government, it is even written that “music volume must be kept low such that teacher does not have to shout over the music to be heard”. The goal here is to prevent virus particles from being spread in larger quantities. Another measure to minimise the risk of having to quarantine all staff in case of a Covid-19 positive person is to divide the staff into two or more independent teams and to try to minimise the contact between these different teams: “in this way, should one of the teams have to be quarantined, the other team(s) would be able to continue”. These measures must be respected because as mentioned by the DPPA, “Dance is a highly physical practice where instructions can often require coming into close contact with the participants to correct movements”.

All these rules make the dance learning and teaching harder and challenging but as mentioned by Giles (2020), “the pandemic is an opportunity for innovation”. The biggest innovation might be the teaching of ballet online via Zoom or other platforms.

⁹ https://www.covid19.qld.gov.au/_data/assets/pdf_file/0021/134715/covid-safe-industry-plan-dance-physical-performing-arts.pdf?nocache-v9

¹⁰ https://deputyprimeminister.gov.mt/en/health-promotion/covid-19/Documents/mitigation-conditions-and-guidances/Obligatory-Conditions-and-Guidelines-for-Dance-Schools-and-Dance-Studios_13Jun20.pdf

The second part of this third chapter focuses on the opinion and feelings of Belgian students, who had to follow their dance classes through Zoom. Through interviews and questionnaires, I wanted to develop a complete understanding of the difficulties they went through.

3.2. Classes on Zoom: the consequences, the advantages or disadvantages and the opinion and experience of Belgian students, the director of the *Conservatoire de la Danse de Bruxelles* and a Canadian Teacher

The objective of this section of the third chapter is to discover the opinion and the feelings experienced by dance students whose way of studying was impacted by the Covid-19 pandemic, the opinion and feelings of a teacher who had to give online classes on Zoom and the opinion and feelings of a director of a renowned Belgian dance school. The different questionnaires used to collect the data can be found in **Appendix 3**.

3.2.1. Ballet students' opinion and feeling about the impact of Covid-19: Data and methods

In order to better understand Belgian students' opinion on and experience of ballet classes in times of Covid-19, I needed to collect data from students. A questionnaire was designed to make it possible for the participants to focus completely on the questions and to provide detailed answers (cf. Table 2). The data collected are descriptive because, as the format is individual questionnaires, I did not intervene.

As can be seen from Table 2, the questions target the potential advantages and disadvantages experienced by the participants. They centre around the feelings experienced by the students. The goal was to get a better understanding of what changed because of the Covid-19 pandemic and which consequences these changes had on the participants. The choice of these questions is also partly based on the themes discussed in section 3.1. Through the questions, I wanted to see if the problems and consequences of the pandemic mentioned in that section were really felt by the participants.

The individual questionnaire was sent by email to the same students as the ones who took part in the interviews about the new technologies used in the learning and teaching of dance (cf. Chapter 2), that is to say Alexandre, Alysson and Cynthia. They were given up to a week to complete the questionnaire to make sure they had enough time to reflect upon their experience before sending me their detailed answers. They were given the possibility of answering the questions in writing (this is what Alysson and Cynthia did) or in audio format (Alexandre sent me an audio recording of his answers). When necessary, I translated the participants' answers from French into English. I also transcribed Alexandre's answers. The participants' complete answers can be found in **Appendix 4**.

A thematic analysis was conducted to identify the participants' common experiences and opinions but also their differing experiences and opinions.

Table 2: Questionnaire dedicated to the three students.

Questionnaire dedicated to the three students.	- On which platform did you follow your classes?
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	- According to you, what were/are the advantages of having online classes on Zoom or online on another platform? - According to you, what were/are the disadvantages of having online classes? What about the feedback, the space, the contact with your friends, the feeling of being part of a team? - Can you please describe (every step of) the development of an online class (did you have to warm up before the class? With which exercises began/ended the class? How was the teacher showing the movements? What about the pianist/the music? - Do you think that one of the new technologies I showed you before could have helped you to keep contact with your teacher? Or could have helped you to practice besides the Zoom classes? If yes, which one and why?
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3.2.2. Ballet students' opinion and feeling about the impact of Covid-19: Findings

This section discusses the participants' answers to the individual questionnaire I sent them. The aim is to explore the feelings they experienced as students during the period under investigation here, namely the Covid-19 lockdown and pandemic.

It clearly emerges from the answers given to the individual questionnaires that all of the participants suffered from this period. Of course, they were not all affected in the same way, but the lockdown and the pandemic had negative consequences for all the participants.

The same three students who took part in my study, namely Alexandre, Alysson and Cynthia, all had their online classes on the Zoom platform. They reported the following advantages of using this platform: the fact that students can still see the other students and the teacher perform because it is live, students are thus not completely alone and also the fact that working on Zoom offers students the possibility to work at their own tempo, and create their own routine:

“You can really work at your own tempo. If you feel like working more on your arms for one class, no one will tell you to do differently. You can focus on things you find difficult.

When you are at school it is much harder to work on things you find hard, but when you are at home, the class goes slower (most of the time) so you can really work on your personal corrections and things you find harder” (Alysson);

“It is kind of nice to be at home all day because you are not as bound to the schedule as usual so you can create your own routine. For example, I could choose how much time I would take for my warm-up and how much time I would take for my cooldown” (Cynthia).

Alysson also stressed the fact that since students are alone at home, they are not distracted by other students or friends. However, it is important to note that Cynthia says exactly the opposite: *“You can get very distracted easily because there are a lot of things happening around you at home”*. This disadvantage stems from the fact that she had no other place to dance than her living room.

However, the downsides cited are more numerous than the benefits. An important one is that the feeling of being part of a team is completely lost because students are alone. Alexandre says for example that because he is alone, he cannot feel the energy of the others and that makes it harder to find the necessary motivation to take the class until its end. Moreover, he says that working on Zoom makes it harder to stay motivated:

“I just didn’t have that feeling [of being part of a team] anymore. I was alone. During that time, I caught the opportunity to discover myself. I tried to focus only on me. So of course, I didn’t have this feeling of being part of a team. This feeling only came back at the very end when we had (when we could) go back to school to receive our degree. But apart from this, the relation I was having with my class was very different than the one I had before. Moreover, on Zoom you can leave the class whenever you want. So according to me, it is harder to find the motivation and the energy to participate to the lesson until the end”.

Cynthia agrees with Alexandre, but she succeeded in finding something positive about the fact of not being able to be at the studio with her friends:

“The feeling of being part of a team is totally lost. But at the same time, I felt so independent and free. After classes I would still follow other dance classes from other companies. I really enjoyed this”.

Lack of (private) space was also mentioned in the problems related to distance learning (cf. Section 3.1 above). Alysson was the most affected by this problem because Alexandre was lucky enough to have an attic which he was able to transform into a dance studio and Cynthia had a garage and garden. However, the space was not sufficient for any of them to practise their jumps.

“I always danced in my living room, I had to move the table and put a floor made for dance. I did have enough space, but it was very small compared to the studios we have at school. There was no place to jump for example” (Alysson);

“It was also hard because we had a lack of space and materials. I, for example do not have a barre at home so I made one with pipes, but it wasn’t very stable” (Cynthia).

The students also mentioned the fact that feedback was significantly impacted: they receive far less feedback:

“I also noticed a difference of feedback from the teacher. It must be harder for the teacher since we are just a small square on a screen, but it is a pity that we barely get any feedback” (Alysson);

“Teachers gave us way less feedback than normally because it is harder to see everyone on a screen. I filmed myself dancing a lot and I did not do this as much before. I really learned to correct myself and this is for me even more effective than a teacher correcting me” (Cynthia).

The format of the class also had to vary to accommodate to Zoom. For example, all the interviewed students explained that they had to be warmed up for the start of the class and often they also had to stretch on their own at the end of the lesson. They also all underlined the fact that they could not practise their jumps at any session because of the lack of space. It can also be noted that for the contemporary class, it was even harder than for the ballet class because the space was insufficient to even dance, which resulted for example, in Alexandre’s case, that the contemporary class was replaced by workouts:

“For the contemporary class, it was indeed very different from the class in the studio because we need much more space for this class, and we simply did not have enough of it. So, we did workouts instead of our contemporary class, which I did not find great”.

Alexandre and Alysson also mentioned that the teacher was most of the time not showing the exercises because students knew them. The teacher showed them the moves only if someone was doing something wrong: *“Most of the time the teacher wasn’t showing the movements because we already knew the exercises” (Alexandre).*

Regarding the music, different strategies were implemented by the teachers. For example, in Alexandre’s class, the pianist was participating in the Zoom meeting. But his Wi-Fi was not working well so students were hearing the music with a delay. That was a big problem, according to Alexandre. In Alysson’s class, the strategy was different. Her group was having hybrid classes so when they were training at school, the teacher would record the pianist and then play the recording during their Zoom meeting. In addition to Zoom meetings, Alysson and Cynthia's teachers also sent some kind of homework to be done during the week via WhatsApp or in video format. The students had to study the combination, film themselves and send their video back to the teacher to be evaluated.

“Sometimes, the teacher sent us exercises via WhatsApp and we had to learn them and practise them until Friday. On Friday, we had to send a video of us practising. That was another way to get feedback, but it is more responsibility for us, but we managed well” (Alysson);

“In the very beginning of the pandemic, we did not have Zoom classes, but our teacher sent us our exam by video, and we had to learn it and each day send her a video of us practising. She then sent feedback to each of us” (Cynthia).

In conclusion, the three students who completed the questionnaire reported that Covid-19 had (and still has) a lot of negative consequences (lack of feedback, lack of space, feeling of being alone, less motivation, no team spirit, problems linked with connection problems) and only very few advantages. It is important to note that, even though there were (and still are) many problems, none of them would have liked to have one of the new technologies presented in Chapter 1 at their disposal to train because these only focus on the technique and because they are not offering a real class.

“According to me, none of the technologies would have worked for me because they were focusing only on the technique and you do not have the feeling of having a true person in front of you” (Alexandre);

“I think none of them would have suited me. I would always prefer to perform live in the studio and get real feedback and work with real friends and partners” (Alysson);

“None of them would have suited me because I will always prefer feedback from a real teacher” (Cynthia).

Whether the courses are given on Zoom or through one of the new technologies such as CAVE or VR, it will never fully suit the interviewed students as what they need most to feel comfortable and progress are: a teacher, contact, simultaneous feedback and to feel the energy as well as the motivation around them. Zoom or new technologies unfortunately cannot offer this. However, it is important to remember that students still prefer Zoom to the CAVE or the VR because through Zoom they can at least see the teacher and their friends.

3.2.3. A teacher’s and a dancing school director’s opinion on and experience of Zoom ballet teaching during the Covid-19 pandemic: Data and methods

To better understand the impact of Covid-19 on ballet classes and complement the picture painted by the students, I set out to collect data from a teacher and from a ballet school director. The teacher is Paola Rodriguez Sterling who teaches in Canada. She was used to teaching online ballet classes via Zoom and I was already in contact with her because she had written an MA thesis connected with the topic of my dissertation. The ballet school director is Jean-Paul Dimmers. He is the director of the renowned *Conservatoire de la Danse de Bruxelles*, which trains both amateurs and future professional dancers. It was important to get input from a school director as this person had to make sure the sanitary rules were respected within the school.

A specific questionnaire was designed for the teacher and a separate one was created for the director (cf. Table 3 and Table 4). The goal was to get a better understanding of what changed because of the Covid-19 pandemic and which consequences these changes had on the participants. The choice of these questions is also partly based on the themes discussed in section 3.1.

The questionnaires were sent via email to the two participants, who were given a week to answer the questions. While the teacher, Paola Rodriguez Sterling, answered them in written form, Jean-Paul Dimmers answered the questions during a phone call with me. Paola’s answers needed to be translated into English. Jean-Paul Dimmers’ answers were first transcribed in French and then translated into English. The participants’ complete answers can be found in **Appendix 4**.

A thematic analysis was carried out to uncover the main aspects the two participants mentioned in their answers.

Table 3: Questionnaire used to collect the teacher's opinion and experience

Questionnaire dedicated to Paola Rodriguez Sterling. (teacher)	- On which platform did you teach the class? - According to you, what are the advantages of giving a class online and why? - According to you, what are the main issues of giving a class online. What were the feelings you were experiencing? - Do you have the sensation of “really” teaching? Or is the fact that you have no contact with your students very hard for you? - Do you have enough space to perform? - Do you think it is a good way to teach students? Or the fact to have to show the movement through a computer is not ideal at all? - How do you do with the music/ the musicians. Do the students hear it well? - Did you experience some issues with bad connection? On your side or on the student's side? What happened if one student has a bad connection and is then “too slow” compared to the music you are hearing? - Can you please describe (every step of) the development of an online class? Do the students have to warm up before the class? With what exercise do you start/ end the class? How do you give feedback?
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	- Would you like to add something?
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Table 4: Questionnaire used to collect the director's opinion and experience.

Questionnaire dedicated to Jean-Paul Dimmers. (director)	- When did you switch to distance learning? On what platform were the courses delivered? - Have you been able to resume giving 100% face-to-face lessons since then? - What changes did you have to make in the studios so that classes could resume on site (adhesive flooring to divide up the space, keeping all the doors open, taking the temperature of the students and teachers, closed changing rooms and showers, disinfecting the bars, need to wear masks, etc.)? - What do you think were the hardest measures to take? - Do you find it difficult to return to the classroom under these conditions? Or is it more of a relief? - As a director, how did you feel about the closure of dance schools and conservatories in March 2020? What was your first action when you heard the news? - As a director, did you feel a psychological impact of Covid-19 on students and/or teachers? - Have any students dropped out of the Conservatory because of Covid-19? - Have some students been affected by the technological precariousness (no computer to follow the courses online, no internet...?) Have you been able to help them? - In your opinion, were the students and teachers able to reach the
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	objectives previously set for the year 2020 when the courses were given remotely? - Are the auditions for September via videos then? - Did you have to cancel all the performances that were planned?
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3.2.4. A teacher's and a dancing school director's opinion on and experience of Zoom ballet teaching during the Covid-19 pandemic: Findings

Paola Rodriguez Sterling taught (and is still teaching) via the Zoom platform. The only two advantages she sees when it comes to remote teaching are, first, that she has the opportunity to teach in different countries while staying in Canada and second, that students are not affected by what she calls “the winter heaviness”, which is caused by the very low temperatures they normally have to face when they go to school in Canada.

Despite the fact that she notices these two advantages, her way of giving lessons has been very disrupted by the Covid-19 situation: *“The first thing I have to do is move some of the furniture around to give me the space I need to teach. Then, I move on to the installation of the various devices (computer, iPod, and speaker)”*.

When answering the questions about the main issues of giving a class online, Paola refers to her thesis. Indeed, a part of her thesis analyses the strategies used to teach ballet. Because of the distance involved in remote teaching, one of these strategies can no longer be applied and this leads to problems in the way feedback is given:

“Taking into account the results of my master's thesis, I can conclude that there are 3 actions by which the teacher mobilises his teaching strategies: 1. Saying it, 2. Seeing it, 3. Doing it. “Touch”, one of the teaching strategies used as part of this third act, is clearly and directly affected in online teaching. It disappears completely and causes a significant gap that the teacher has to fill with other strategies”.

As Marika Besobrasova was explaining to Warren (1996), while giving feedback, the teacher sometimes needs to touch a student's muscle so he/she can understand which muscle needs to be activated in order to perform correctly. As mentioned by Paola, this strategy that she calls “Touch” is completely lost in the online teaching of ballet.

According to her, space was also a big problem for her students. In fact, she even said that she had more space than most of them, who had to take the lesson in their kitchen, their bedroom or in the basement:

“I have a sort of table and a stool that serve as a bar (I alternate between the two so that I can show different angles of the same exercise). And for the exercises in the centre, they are structured in such a way that the students can perform them wherever they are.

Some are in the kitchen, some in the middle of the living room, some in their bedroom, the basement; I think I have a lot more space than many of them”.

After having created some space, she has to prepare everything for the music. She uses loudspeakers but she says it is not enough to provide good quality and this causes difficulties:

“I have activated all the possible settings to get a better sound quality, but I think this is not enough. Before I put on the music, I do sound tests to confirm that the learners are correctly hearing it. The connection and the devices used for the learners come into play and can affect the performance during the class, as it distracts the learners and they become preoccupied with technological problems and they cannot deal with the technical or artistic elements of the class”.

The students are easily distracted by the poor quality and focus more on the music than on their technique. To address this, Paola created exercises where she would only focus on the quality of the movement instead of the musicality, so students are not distracted if they do not hear the music anymore:

“Concerning the gap between sound and image which will be quite present during the lessons, I focus more on the quality of the movements and not on a precise musicality. The exercises are therefore structured in a specific way to allow these qualities to be observed”.

This is one of the strategies that she found very helpful for her students. However, she adds that even if the connection is good, there is always a delay between sound and image and students often have to disconnect to come back after, if they can. When the student cannot find a solution to reconnect himself/herself, it is very frustrating for both the teacher and the student

However, even if there are a lot of different problems occurring during her class, Paola still has the feeling of really teaching, because, as she explained, she manages to connect with the students and thus to achieve technical results even if she really misses not seeing them:

“I feel like I'm really teaching. In all the contexts in which I do it (leisure and professional; for children, teenagers and adults; with students in Canada, Mexico, Colombia and Europe) I manage to connect with the students and have technical results, among others. And at the same time, not having contact with the students is difficult, I miss it very much, especially with the children”.

When she started teaching online last year in March, she thought, like most people, that this situation would last only two weeks, as announced. She was working every day of the week to offer different classes and despite the fact that she was very tired, she was happy to provide fulfilment to the children thanks to her lessons. But when she learnt that the lockdown was extended for an undetermined period, she understood that she would not have enough money to pay her bills. At that time, she was in shock:

“I was in shock (as we all were), because at that time various things came into play: I was not going to have the money to pay my rent or my bills, one of the schools where I was teaching was going to close down for good, the other school was not giving news and I could not teach the classes on my own because the community centre where I was renting a place to teach was also closed”.

Since then, solutions have been found and she says that she now has a feeling of gratitude and fulfilment because she did her best:

“As chaos set in, some solutions also began to emerge: the government offered financial aid, one of the schools decided to continue the session online (we are still there) [...]. After all the efforts of this year, the different achievements at the end of each session, as well as the comments of the parents and families of the learners, I have feelings of gratitude and a sense of well-being for having done my best, in the midst of this chaos, thanks to the constancy, tenacity and endurance of a team: parents/family, learners and the school/me”.

As a conclusion, although the virus has had a big impact on the way ballet is taught, Paola has been able to push herself to find solutions and offer moments of sharing and learning to all her students through her computer screen.

As I thought, Jean-Paul Dimmers reported that Covid-19 had (and still has) a lot of negative consequences for the ballet world. The biggest one is probably the fact that students over the age of 12 stayed three months without any lessons at all because online classes were not ready at that time.

As pointed out by the director, it is thanks to the young students under the age of 12 that the bills and the rent could still be paid because students under the age of 12 were the only ones allowed to be taught on site according to the Belgium Government regulation:

“[...] we have always continued to offer face-to-face lessons for children up to 12 years old because, for them, we had the authorisation to do lessons with a maximum of 10 pupils per class. We kept [these classes] and that's what saved the school. We still have 25 children under the age of 12 and it is thanks to them that we managed to keep paying our rent”.

To be able to give on-site lessons to these students, other measures needed to be taken. For example, large printed panels featuring “keep your distances”, “wash your hands” had to be made and displayed and gel dispensers had to be bought. Of course, students started to wear a mask and all the barres and frequently touched surfaces had to be often disinfected. Students could not stay after the class either:

“We are living in very difficult times because students have to be masked, they cannot go into the changing rooms, they cannot chat after a lesson. They can no longer have a cup of coffee together after class. There are a lot of restrictions and the joy of sharing is no longer there”.

According to the director of the *Conservatoire de la Danse*, there was one measure that was the hardest one to maintain: because they could not have all the students in the studio for every lesson (as was the case before Covid-19), teachers had to select the students who were allowed to come on site, and they inevitably favoured the best students that had a professional career ahead of them. As explained by Jean-Paul Dimmers, this measure had huge consequences. In fact, parents whose children were not allowed to come to the studio to let better ones train were disappointed and decided, as a result, to not pay the monthly 300 euro fee:

“Parents used to pay 300 euros per month. But some parents said that since their daughter only came 5 times, 5 times 10 euros, that makes 50, so I pay you 50 euros and not 300 euros anymore. And so, the parents took the initiative themselves to modify the annual fee by the number of lessons given. This means that automatically in this case, instead of having 1000 euros per month for the whole class, I only have 650 euros left. But the rent is always the same. The salary I pay my teachers is always the same [...]. So, the fact that I have to favour some students has consequences that are not easy to deal with”.

This created big cuts in the budget. These cuts led to the economic layoff of the pianist and the cleaning staff. This, in turn, meant that Jean-Paul Dimmers had to clean and disinfect the entire school himself. He also sacrificed part of his own salary to cover the huge shortfall:

“I have a huge shortfall to pay all the expenses that are fixed. So, it's my salary on the side that compensates and allows me to bail out the school a little. Otherwise, it's not sustainable”.

Fortunately, according to him, Covid-19 has not had a negative psychological impact on the students or teachers because the motivation and determination is bigger than the fear. Thanks to online competitions, teachers found a way to keep their students motivated:

“We individually coached each teenager, who was ready to take part in the competition and once the dancer had learned his or her variation, we brought in a cameraman, who, masked, filmed the dancer doing his or her variation. Then we sent the recordings we made by video abroad. This way, there are still competitions that continue to take place. Our children are selected, rewarded, and so we have succeeded, thanks to these competitions, in keeping the dancer motivated”.

However, even if motivation was very high, 10% of the students dropped out of the *Conservatoire* during the lockdown. Jean-Paul Dimmers explains that, in dance studies, there is always pruning that is done naturally. He thinks that this year, Covid-19 was an excuse for some students to stop. Some other students gained weight during the lockdown and realised it was not worth insisting and coming back:

“Their bodies changed, and they realised that it wasn't worth insisting anymore. It's sad, but it's a reality. We have children who are beautiful when they are eight years old and then, when they are fifteen or sixteen, depending on the morphological genes of the parents and heredity, you have girls who start to get big thighs, buttocks, etc. and it is useless to want to push them in international competitions, they will not pass the first minute”.

Even if UNESCO mentions the often-faced problem of technological precariousness (cf. Section 3.1 above), every student at the *Conservatoire de la Danse* had the equipment needed to follow online classes. However, Jean-Paul Dimmers ended the phone call during which he answered my questionnaire saying that if the situation does not evolve positively over the next six months, he and the *Conservatoire de la Danse* will not be able to survive financially, and children will be completely demotivated.

3.2.5. Conclusion

As demonstrated throughout this chapter, the Covid-19 pandemic and subsequent lockdown have had a number of negative consequences in the world of classical dance.

More or less strong measures had to be taken so as to avoid the spread of this highly contagious virus. One of the first drastic measures was the complete closure of dance schools and studios. This resulted in many young dancers not being able to train for a certain period of time. Fortunately, as explained in the first section of this chapter, some people had the good idea of creating websites, applications and online courses such as the “Veyette Virtual Ballet School”, or the “lon1” application to allow dancers in need of training to practice their passion. After closing down the schools, the teachers had to find solutions in order to continue teaching and they turned to online courses, especially via the Zoom platform. Taking ballet classes online has however caused many problems. Students and teachers did not have enough space to practice jumps, some students had to follow the lessons from their living room or their dining room and were therefore very often distracted by everything that was happening around them. In addition, neither the teachers nor the students had the necessary equipment to practice properly. So, they danced with the help of pipes, chairs and tables. In some poorer countries, UNESCO also noted the risk of technological precariousness, but this was not observed in my case study.

Having the classes online also had a negative effect on the way feedback is given. Some teachers found solutions, such as some dancers turning on their cameras and others turning them off to focus on a small group at a time, but the interviewed students still felt that the feedback was not as detailed as in the studio. Feedback is highly essential for them if they want to improve and progress.

Later in the pandemic, schools were able to accommodate a limited number of students in the studios. However, in order to comply with health standards, schools had to implement a number of measures such as taping the floor to demarcate areas, closing showers and changing rooms, dividing classes into smaller groups, purchasing hydro-alcoholic gel dispensers, and making it compulsory to wear masks. These measures caused a negative impact on the students who could no longer share a cup of coffee with their friends or chat after class, but also on the schools themselves. As Jean-Paul Dimmers explained, some of the measures had dramatic financial consequences and resulted in significant budget losses.

We can therefore conclude this chapter by saying that the Covid-19 pandemic and the lockdown that followed had (and still have) negative, even dramatic consequences for the pupils, the teachers but also for the schools.

All the participants hope for a quick return to a more normal situation so that they can continue to learn, teach and run the studios in a pleasant, efficient and productive way.

4. Conclusion

Throughout this dissertation I have been guided by two common threads: the question of the effectiveness of new technologies within a dance learning and teaching context, and more specifically in relation to ballet, and the question of the impact of Covid-19 on the way dance is taught and learned. In order to determine the effectiveness of the five new technologies focused on, as well as to determine the greater or lesser impact that Covid-19 had had in the world of dance, a theoretical part was necessary to introduce the new technologies selected.

After a brief presentation of three great masters in the history of ballet, the first chapter focused on a detailed description of the CAVE environment, Virtual Reality, VideoTrace, Web-based ICT applications and DanceForms. This discussion focused on how these different technologies work as well as on their positive and negative aspects.

Thanks to the qualitative research carried out after this theoretical part, the opinions of three Belgian students who had never worked with these new technologies were explored. The qualitative research was based on data from individual interviews which enabled me to be in direct contact with the three participating students and to explain to them, with the help of a PowerPoint presentation, how the five technologies work.

Thanks to the detailed answers that the students gave me, the question: "Would the five new technologies presented in chapter one be welcomed in Belgian dance schools according to the students themselves?" can now be answered. The answer, according to these three students interviewed, is "no", for reasons that were mentioned several times in the interviews.

'No', first of all, because some of these new technologies (e.g., the CAVE and the VR) are only concerned with the technical part. These two technologies only offer feedback, as little detailed as it is, on the technical side of things. Nothing is given about the dancers' expression or the way they breathe. As highlighted in the section about Marika Besobrasova, breathing is extremely important in dance. The students interviewed agree with this and are therefore not happy that the feedback is only technical.

Secondly, 'no', because although feedback is given, it is not at all detailed enough to allow the dancers to evolve. The muscles are never illustrated and, as Marika Besobrasova explained (in Warren, 1996), a good teacher must be able to see under the skin of a student and to see his/her muscles to be able to correct him/her properly. With such technologies, students could arguably never evolve as well as with a real teacher who knows about anatomy.

'No' because the students all say that such technology could never be as helpful as a real teacher. Alexandre, Alysson and Cynthia all reported that being in contact with a real teacher and being able to ask questions was essential. In addition, when a teacher points out a mistake, he/she then explains how to correct it. Technology cannot help in this way (yet). Furthermore, as far as real contact is concerned, students said that they needed to be with other students, to feel their motivation and energy in order to be motivated. Being alone in the CAVE environment or alone in front of their wall with an avatar teacher does not tempt them at all. As for the new technologies that cannot totally replace a teacher but come more as support like VideoTrace, DiViDU or DanceForms, Alexandre, Alysson and Cynthia seem to be more receptive without being convinced, however.

‘No’, because with these technologies the student is not free to add a personal note as it would be seen as an error. According to Cynthia, Alexandre and Alysson, being able to add one's own note, a bit of one's personality in one's dance performance is very important and also appreciated by the teachers. Here again the technologies discussed do not allow this.

‘No’, because for some of these technologies, the dancers have to wear either glasses or a capture suit so that their movements can be recorded, and they can receive feedback. Alexandre, Alysson and Cynthia all agree that wearing either glasses or a capture suit must be very distracting and does not allow them to dance as they would live in a studio.

The software DanceForms was judged to be too difficult to use and thus not appropriate for dancers. One of the students even added that, according to her, someone who is creating choreographies with this software just by picking up the moves and without modifying them is not a real choreographer and the piece he/she would create would never be his/her own piece. Even if a user guide is provided in different languages, students still think it is not ready to be used by dancers yet because it is too complicated.

The only new technology that was considered helpful was VideoTrace thanks to the possibility to annotate the video of a student directly (DiViDU was considered a little helpful because of the possibility to film yourself). Students agreed to say that it was a time-saver to not have to go back in the video to search for a specific moment but to have direct feedback on the video. However, Alexandre, Alysson and Cynthia all agreed that it is still easier to film themselves with their phones and then compare their performance with their friends’ ones.

The conclusion can then be drawn from the interviews with the three dance students now seeking a professional career in the world of ballet that these new technologies will not really bring any advantages to the teaching or learning of classical dance. A real class with real teachers and real students, as well as real feedback both on the technique and on the performance aspects is required for a student to have a chance to succeed as a professional dancer. In regard to the possibility that some of the technologies offer to film one’s performance, students agree that a smartphone can do the same and it is even done more easily. At the moment, and based on the opinions gathered from these three students, if these new technologies were to be used as they are today (*i.e.* with poor, non-detailed feedback, teachers in the form of avatars, etc.), they are not likely to be warmly welcomed by dancers who value real contact with their teachers and friends in order to progress daily.

Thanks to the second qualitative research that was carried out, the second research question, namely “What were the biggest negative and positive consequences of the Covid-19 pandemic and lockdown for students, a teacher and a director?” can now be answered too. The data collected using individual questionnaires makes it possible to list the negative as well as the positive consequences of the impact of the Covid-19.

First of all, the biggest negative consequence is that all the lessons for students aged over 12 had to be given online (if they were given at all). This automatically means that students are alone at home and receive less feedback. As Paola Rodriguez explains, feedback has been badly hit by the Covid-19 pandemic because teachers no longer have the possibility to touch the student while giving a correction. As Marika Besobrasova mentioned it (in Warren, 1996), touching a muscle is very important as it makes the student understand what muscle he/she has to contract. This kind of feedback is completely lost with online classes.

Another thing that is completely lost is the feeling of being part of a team. Students are not able to be with their friends anymore, they cannot be motivated by them nor motivate them. Moreover, students can easily leave a meeting on Zoom without the teacher noticing it, so it is harder for dancers to find the motivation to stay until the end.

Space was a problem both for students and for teachers. Jumps could not be practiced because of the lack of space. Some students were distracted because a lot of things were happening around them at home. The routine of both teachers and students was and still is disrupted and the first thing they have to do is to put away furniture to create some space.

Another common problem for both teachers and students was the lack of material. They had to find solutions like using pipes, chairs or tables instead of a barre.

Dealing with the music was not easy either. Teachers had to use loudspeakers and music from their iPad or smartphones, or sometimes a pianist was in the Zoom meeting but in the two cases, bad connection was creating a lot of problems. The only advantages that were mentioned by the students were the possibility for them to work on their own tempo and to focus on their difficulties. The ones cited by the teacher, Paola Rodriguez, were the possibility to teach in different countries while staying at home and the fact that she did not have to travel in -20° to teach a class.

The consequences of Covid-19 cited by a dance school director are quite different. In fact, Jean-Paul Dimmers, the director of the *Conservatoire de la Danse de Bruxelles*, stated that the worst consequences of the pandemic were the large budgetary losses. These budget losses are secondary consequences of Covid-19. Indeed, because of Covid-19, courses could no longer be given on site and online courses were not ready for this school at the beginning of the pandemic. An exception was and is still made for high-level students, who have a chance to break through professionally. For them, who are very few in number, the courses are maintained with a mask and distance. Unfortunately, the other parents do not accept that some dancers are favoured and therefore decided to stop paying the sum of 300 euros per month. They began to pay the fee for one lesson (10 euros) multiplied by the number of lessons their child actually received during the month. This caused Jean-Paul Dimmers to lose a lot of money. He had to lay off his pianist and he also had to let go of his household help. Since the beginning of the pandemic, the parents have still not started paying the right price. Jean-Paul Dimmers confided that if the situation goes on like this for another 6 months, the conservatory will not be able to survive.

Other negative consequences of the lockdown are that 10% of the students have dropped out of the *Conservatoire* and that all performances had to be cancelled and still have to be cancelled. However, as Jean-Paul Dimmers explains it, students are fortunately still motivated thanks to online competitions because it pushes them to give their best. The director of the *Conservatoire de la Danse* nevertheless believes that if the situation does not change quickly, students and teachers will become demotivated.

The conclusion can thus be drawn that the Covid-19 pandemic and the lockdown have had (and still have) more negative consequences than positive ones. The situation needs to quickly change if many dance schools are to remain open and many dancers are to remain motivated and passionate teachers are to remain in employment

The findings from this master thesis thus suggest that the new technologies discussed here are not good enough to be implemented in the Belgian world of ballet. In addition, Covid-19 has had more negative impacts than positive ones on the teaching and learning of dance.

Some limitations in my study should be noted. Because of the Covid-19 pandemic, I did not have the possibility to meet participants face-to-face, this means that the different interviews had to be held online. Furthermore, the Covid-19 pandemic meant that most students were overwhelmed and perhaps also psychologically affected, which meant that only a few agreed to participate in my study.

Future studies could be conducted when new technologies have been improved and have made their way into the world of classical dance in Belgium in order to explore whether they can really become an asset to the learning and teaching of ballet.

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