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The flipped classroom learning model as a means for acquiring the 21ˢᵗ century skills

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Abstract: *In a knowledge based economy students are expected to acquire a certain set of skills that will enable them to have a positive impact in society. The 21ˢᵗ century skills are considered to be the answer to their social and professional inclusion and education plays a key role in providing students with the opportunity to develop these skills. To address the challenges of the future, educational frameworks need to be redesigned so that they can cultivate this set of skills. The advancement of technologies can contribute to the realization of an educational paradigm shift while the teachers' role in the learning process remains fundamental. The flipped classroom is a new learning model where the learning activities inside and outside the classroom are rearranged. Several studies have indicated that flipping the classroom promotes the cultivation of the 21ˢᵗ century skills, such as critical thinking, creativity, metacognition, problem solving, collaboration, motivation, self-efficacy, conscientiousness, grit and perseverance. On the other hand this pedagogical approach could be quite challenging since it presents many barriers that need to be removed so that the method can deliver the desirable learning outcomes.*

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1   INTRODUCTION

Nowadays, due to the rapid changes in the economic and social contexts it is imperative that educators redesign their teaching methods, create an innovative learning experience and support their students in acquiring the 21ˢᵗ century skills (Council of the European Union, 2018). Today's students seem to have boundless and free access to information, therefore the key for their education, is not the memorization of information but the ability to search and manage information. Also, the advancement of new technologies provides teachers with the opportunity to alter their methodology in order to promote their students active participation in the learning process. Since teachers are no longer expected just to provide students with knowledge but to help them develop a set of skills such as problem solving, critical thinking, creativity, teamwork, metacognition, effective communication and social skills so that they can meet the challenges of the modern world, their role is more crucial than ever in achieving the desired learning outcomes. The New Skills Agenda for Europe, states that formal education and training plays a key role in enhancing students' basic skills as well as in fostering their transversal skills and key competences (European Commission, 2016). Since every student is unique, teachers are challenged to organise a learning environment that meets the differing needs of each student so that they can provide them with the opportunity to learn, regardless their abilities and their cultural, social and economic backgrounds. Therefore, reshaping education is

the medium to provide students with equal access to knowledge, skills and competencies, to promote their social and professional inclusion, their well being, so that they can have a positive impact in society (OECD, 2019). As argued by Dumont, Istance and Benavides (2010), students are the core of the learning process and as Roehl, Reddy and Shannon (2013), state teachers need to put students in the center of the learning process so that there is a move from memorization to students actively constructing their own knowledge. According to Prince (2014), the term active learning is used to describe various forms of pedagogical approaches, where the students from passive receivers of information and instructions become actively involved in the learning process, they get engaged in the learning activities in a way that they become co-producers of their own knowledge. On the other hand constructive learning is a theory that argues that when students are faced with new information, they recall their old knowledge, combine it with the new information so that they produce the final outcome of the learning process (Bada & Olusegun, 2015). Taking under consideration the above, it comes as no surprise that in recent times there is a move from the teacher-centered to the student-centered learning model (Kennedy, 2006, Kennedy, Hyland & Ryan, 2007). This paradigm shift in education has resulted to the development of new learning models and methods such as the flipped classroom, where the teacher does no longer provide just a lecture but becomes the students' guide and supporter at their educational path to learning.

2   THEORETICAL FRAMEFORK

As nowadays economies and societies become more based on knowledge and information, education plays a fundamental role for achieving individual and organisational growth, since it is the core of the knowledge based economy (OECD, 1996). In the knowledge based society students have to acquire the 21st Century skills, which are a set of skills that will enable them to have a positive impact to their professional and social environment in the future (Ananiadou & Claro, 2009). As Lamb, Maire, & Doecke (2017), argue the most frequently cited skills at the existing literature regarding the 21st Century skills theme, are critical thinking, creativity, metacognition, problem solving, collaboration, motivation, self-efficacy, conscientiousness, grit and perseverance. As Ennis (2009), states critical thinking is proper evaluation of assertions. Critical thinking can also be defined as the ability to improve the odds of achieving desirable results by using a set of skills and tactics, whereby the concept of what is desirable relies on the individual's objectives and value system (Halpern, 2001). According to Cropley (2011), creativity is broadly described as the construction of appropriate and efficient innovation. Furthermore, metacognition is the ability that makes people capable of realizing the way they learn or think (Schraw, 1994; Schraw, Crippen & Hartley, 2006). The OECD (2014), defines problem solving as "*an individual's capacity to engage in cognitive processing to understand and resolve problem situations where a method of solution is not immediately obvious. It includes the willingness to engage*

with such situations in order to achieve one's potential as a constructive and reflective citizen" (OECD, 2014; 30). Camarinha-Matos et al. (2009), state that collaboration is the process where individuals work together sharing tasks, responsibilities and recourses in order to create something together or to attain a shared goal. On the other hand, motivation is the process that triggers an individual to take action in order to reach an objective (Schmidt et al., 2010). Moreover, self-efficacy is the individual's capacity to execute a task or to carry out something (Lamb, Maire, & Doecke, 2017). As John and Srivastava state "*conscientiousness describes a socially prescribed impulse control that facilitates task and goal directed behaviour such as thinking before acting, delaying gratification, following norms and rules and planning, organizing and prioritizing tasks*" (John and Srivastava, 1999;121). Perseverance can be defined as the persistence in pursuing a goal despite the obstacles, difficulties or delays in attaining this goal. As Duckworth et al. (2007), argue grit is the persistence, commitment and enthusiasm towards the accomplishment of a goal, whose intensity remains at the same levels in the long term as it can't be affected by difficulties, setbacks or obstacles.

Since the 21st Century skills are the means that enable individuals to keep up with development, adapt to change through lifelong learning and to improve their economic status, their acquisition should be considered as every individual's right. Without the cultivation of 21st century skills people cannot claim high-paying jobs and they are condemned to serve in positions that do not require high skills (Kay, 2010). Taking under consideration the above, the 21st Century skills acquisition can also be seen as the tool of integrating individuals into the contemporary economic and social context.

In order to effectively face up to the challenges of the knowledge economy, arises the need to improve and modernise education (European Council, 2000), so that students are equipped with the necessary knowledge, skills, attitudes and values so that they become drivers of change to the creation of an inclusive and sustainable future world (OECD, 2018). In response to this call many educators have worked to develop innovative education, new teaching and learning methods in order to meet the educational demands of this new era.

A shining example of these endeavours is the chemistry teachers, Jonathan Bergmann and Aaron Sams, who worked at Woodland Park High School in Colorado. The two teachers were confronted by the fact that some of their students were many times absent from class due to sport activities and this affected their learning. Bergmann and Sams were eager to solve this problem so that their students wouldn't miss out on their education. In 2007, they came up with the idea to use software to record their lectures so that their students could watch them when they had available time. The results of their efforts were more than satisfactory as not only their method was accepted enthusiastically by absentee students, but also students who were present in the delivery of their lessons began to watch the videos for further study or for their exams. Not long after they uploaded their videos they started receiving messages from all over their country and beyond, by students and teachers who were making use of their

method which became known as "the flipped classroom" (Bergmann & Sams, 2012). Before "the flipped classroom", a method called "the inverted classroom" was introduced by Lage, Platt and Treglia (2000) and is considered as the precursor of the flipped classroom. The flipped classroom model that was introduced byBergmann and Sams (2012), is a form of the blended learning pedagogy where the teaching and learning are rearranged inside and outside the classroom (Paniagua&Istance, 2018). When implementing the flipped classroom model, teachers prepare videos with their lectures and upload them on the web so that they are available to their students to watch at any time at their own request, no matter where they are. This provides students with the advantage to pause, rewind or fast forward the videos according to their differing needs. The next day, in class, the teacher discusses with the students, provides clarifications or further information and assigns activities which are personalized according to the students' needs (Bergmann &Sams, 2012). In this way the time that was needed to conduct the lecture is now available to carry out more engaging activities in the classroom. According to Bergmann and Sams (2012), after adopting the flipped classroom model, they had approximately 40 to 55 minutes more for practice or lab activities in comparison to the traditional classroom (Table1.)

Table1. Comparing class time in traditional versus flipped classroom

Traditional Classroom		Flipped Classroom	
Activity	Time	Activity	Time
Warm-up activity	5 min.	Warm-up activity	5 min.
Go over previous night's homework	20 min.	Q&A time on video	10 min.
Lecture new content	30–45 min.	Guided and independent practice and/or lab activity	75 min.
Guided and independent practice and/or lab activity	20–35 min.		

Note. From *"Flip your classroom: reach every student in every class every day"* by Bergmann, J. &Sams, A., 2012, p. 15.

This extra time is really valuable since it can be used to transform the activities that students perform in classroom. When a teacher follows the flipped classroom method, as Tucker states the "*class becomes the place to work through problems, advance concepts, and engage in collaborative learning*" (Tucker, 2012; 82). Several studies have indicated that students' evaluation of the flipped classroom experience is positive (Butt, 2014; Fauzan & Ngabut, 2018; Karabulut, Yao, Savolainen & Jahren, 2017; Khanova, Roth, Rodgers, & McLaughlin, 2015; Kim, M. K., Kim, S. M., Khera, & Getman, 2014; Tune, Sturek, & Basile, 2013). Also, an extensive literature review about the advantages and the challenges of the flipped classroom that was conducted by Gökçe Akçayır and Murat Akçayır and published in 2018, indicated that the flipped classroom learning model provided many advantages which they classified in six main categories, "*Learner Outcomes, Pedagogical Contributions, Time Efficiency, Dispositions, Interaction and Other"*(Akçayır G. & Akçayır M., 2018; 339). In their paper,

Akçayır G. and Akçayır M. (2018), presented the results of previous research which argued that among others, the flipped classroom model, boosts critical thinking, stimulates creativity, improves learning performance, puts focus on problem solving, promotes collaboration, motivates students, enhances students' self-efficacy, improves their attendance, increases their efforts therefore it enhances students' responsibility for their learning and engages them in learning process (Table 2.).

Table 2. The advantages of the flipped classroom

Inductive categories	Sub-categories
Learner Outcomes	Improves learning performance
	Satisfaction
	Engagement
	Motivation
	Increases knowledge
	Improves critical thinking skills
	Feeling more confident
	Promotes creativity
	Focus on Problem solving skills
	Better retention
	Improves application skills
	Improves ICT skills
Pedagogical Contributions	Flexible learning
	Enables individualized learning
	Enhances enjoyment
	Better preparation before class
	Fosters autonomy
	Offers collaboration opportunities
	Enables more feedback
	Fosters higher self-efficacy
	Provides peer-based learning
	Increases study effort
	Supports interest in the course
	Improves attendance
	Suitable for large group teaching
	Decreases withdrawals
Time Efficiency	More efficient class time
	More time for practice
Dispositions	Positive feedback from students
	Positive perceptions (students)
	Positive attitudes
	Positive perceptions (teachers)
Interaction	Interaction (Students-Instructor)
	Interaction (General)
	Interaction (Students-Students)
Other	Less anxiety
	Cost effective
	Students adapt quickly

Note. From *"The flipped classroom: A review of its advantages and challenges''* Akçayır,G., Akçayı, M. (2018), p. 339

In addition, Sojayapan, and Khlaisang (2018), argue that the model stimulates collaborative learning and teamwork, makes students more responsible about their learning and improves their communication skills due to their increased interaction. Furthermore, the use of this model enhances students' engagement in the learning process which directly and positively affects their knowledge and skills (Murillo-Zamorano, López-Sánchez, &Godoy-Caballero, 2019).Also, it boosts critical thinking and creativity, with students reporting a high level of satisfaction (Rodríguez, Díez,

Pérez, Banos, & Carrió, 2019). Al Zahrani (2015), argues that the model influences positively the students' creativity, who declare the experience satisfactory. According to Karabulut, Yao, Savolainen and Jahren (2017), the flipped classroom promotes collaborative problem solving and enhances the interaction of students with their classmates and their teacher. Moreover, Van Vliet, Winnips and Brouwer (2015), state that this model enhances the students' metacognitive skills, making them capable of realizing the way they learn or think (Schraw, 1994; Schraw, Crippen & Hartley, 2006; Kourakou, 2018; Boza, 2019) and promotes collaboration in the learning environment. In light of the above it could be argued that the flipped classroom model fosters the cultivation and the enhancement of the 21st Century skills.

But as Chen,Y. Wang, Kinshuk, and Chen, N. S. (2014), argue this model can be beneficial if the arising challenges are addressed. According to Chen et al. (2014), the challenges may relate to students' resistance to flipped classroom adoption and their lack of motivation which increases the educational gap between students. Akçayır G. and Akçayır M. (2008), provided many findings about previous studies that examined the challenges that arise when implementing the flipped classroom that they classified in the following categories, "*Pedagogical, Students' Perspective, Teachers' Perspective,   Technical and Technological, Other*" Akçayır G. & Akçayır M., 2018; 340) which are presented in Table 3.

Table 3. Key challenges of the flipped classroom

Inductive categories	Sub-categories
Pedagogical	Limited student preparation before class Students need guidelines at home Unable to get help while out of class Inability of instructors to know if students watched videos or not Effects of the flipped method not long lasting Implementation issues
Students' Perspective	Time consuming Workload increase Students do not prefer it Adoption problems Anxious about the new method Resistance to change Students find the method unfair/unreasonable
Teachers' Perspective	Time consuming Higher workload Difficult to manage tasks Planning the sequence of activities
Technical and Technological	Quality of videos Inequality of technology accessibility Need for technology competency (students) Cost Need for technology competency (teachers) Requirements of specific infrastructure
Other	Parental bias Lack of institutional support

Note. From *"The flipped classroom: A review of its advantages and challenges"* Akçayır,G., Akçayı, M. (2018), p. 340

Moreover, Al Zahrani (2015), argues that students declare this approach, as more demanding in terms of their preparation and effort and they also report some problematic aspects regarding the communication of the goal setting, the interaction with their teacher and the quality the educational resources. On the other hand, there are also challenges for the educators in terms of preparation and time (Giannakos, Krogstie, & Chrisochoides, 2014; Looet al., 2016; Tan, Brainard, & Larkin, 2015;), lack of skills and knowledge (McLaughlin, White, Khanova, & Yuriev, 2016), inadequate funds and internet accessibility (Christou, 1999; Sigala & Valachis et al., 2008; Christou, 2009; Roehl, Reddy, & Shannon, 2013; Nikolaou, 2018; Tsaple & Tzionas, 2019).

All in all, with learning barriers removed, the adoption of the flipped classroom model, though demanding, can be constructive and advantageous for the students and for the society as a whole. Therefore, this paper apart from presenting the key role of the flipped classroom in acquiring the 21st Century Skills and the challenges that arise when implementing it, seeks to identify potential solutions from the teachers' perspective in order to address these challenges.

3   METHODOLOGY

The aim of this research is to generate and develop ideas from the teachers' point of view about corrective measures that can be taken in order to eliminate barriers in the effective implementation of the flipped classroom model. When there is a need to extract data from a group of people specifically chosen for the purposes of a study, focus groups can be selected as the research method (Christou & Nella, 2010; Nyumba et al., 2018). Focus groups are a popular qualitative research tool (Wilkinson, 2004; Nair & George, 2016) which has mostly been chosen by marketers and politicians (Lyons & Branston, 2006; Barron & Watson, 2007; Williamson, 2018), but recently its application has been extended to other areas such as education (Eaton & Christou, 1997; Williams & Katz, 2001; Fu & Kapiki, 2016). As Carey (2015), states focus groups provide a framework, which under certain conditions allows the researcher to draw conclusions that wouldn't be accessible with the application of another method. As Krueger and Casey (2000), argue a focus groups' characteristic is homogeneity but also the sufficient variability of its members so that different views are expressed. Krueger and Casey (2000), also state that the focus group members share a common characteristic that is a key element for research, such as their profession, and that the size of a focus group is better to vary from five to a maximum of ten persons since more than ten presents difficulties to manage.

Having said the above, for the purposes of this qualitative study, focus groups were selected as the research method. One focus group consisted of six people was conducted. The purposive sampling technique was used and participants were intentionally selected because of the characteristics that they had. Therefore, all the participants were secondary education teachers since the theme of the study was particularly interesting to them, they had almost the same teaching experience which ranged from 15 to 17 years and they were of many teaching specialities such as Science, Maths, Greek literature, Economics, English Language and ICT in order for different opinions to be expressed during discussion. Open ended questions were designed for each challenge reported by Akçayır G and Akçayı M. (2018),   so that participants

could express as many ideas for solutions as possible. The focus groups took place on the 4th of October 2019, at the premises of the Directorate of Secondary Education of Pieria, Greece. The moderator had taken care of the necessary details to create a comfortable environment for the participants. When participants arrived they were welcomed by the moderator who thanked them and provided general guidelines and information about the purpose of the focus group and its estimated duration. In the beginning the moderator clarified to the participants that there were no right or wrong type of answers and that they should feel free to express their thoughts and ideas openly. The moderator made known to participants that the focus groups were being recorded by using a sound recorder software in order not to miss any of the expressed opinions and ideas. The moderator underlined the confidentiality of the whole process and the use of only the first names of the participants. Then, in order to prepare them for the discussion the moderator asked some questions so that participant can know each other. Apart from facilitating discussions the moderator also kept notes. At the end of the focus group, which lasted 1hour and 20 minutes, the moderator made some questions to summarise the discussion and thanked all the participants for their active involvement in the discussion. Afterwards, the voice recording was immediately transcribed and the moderator read the transcripts many times in order to become familiar with the data. Open coding was used to analyze the data, codes were developed and then they were categorised into themes. In order to check the validity of the analysis and the findings, a participants' validation was conducted, therefore as Chioncel et al. (2003), suggest the members of the focus group studied the produced report which they found accurate and complete.

4   RESULTS AND DISCUSSION

From the analysis of the qualitative data ten themes were identified which are, emphasis on quality, active participation, monitoring, accessibility, motivation, planning, communication, effective time allocation, funding and providing means. The themes, categories and participants' relevant quotes are presented on Table 4. As participants underlined, one of the major solutions to overcome the challenges of the flipped classroom is that emphasis should be given on the quality of teaching material, the technical quality of videos and the quality of the activities which are implemented in class. Participants also acknowledged that active participation of all the involved parties, such as students, teachers, parents and other important stakeholders, like supervising authorities, plays a key role in the effective implementation of this model. Also, they expressed that there is a need to establish a monitoring system so that to ensure students participation. Moreover, special care must be given in providing assistance out of class by creating and developing communication channels and cooperation networks.

Table 4: Solutions to overcome the challenges of the flipped classroom from the teachers' perspective

Theme	Categories	Participant discussion
Emphasis on quality	Improve quality of teaching material	'make the lesson attractive and interesting for students to watch " the video must catch students' attention" "well prepared videos not just a copy paste from internet sources" "it must take into account students' needs" "it should be more interactive" "it should be not less information and more about students discovering new knowledge"
	technical improvement of video quality	" teachers must have access to the necessary equipment " "teachers must have access for technical support if needed" "teachers must improve their ICT competences" "teachers must collaborate"
	improve quality of classroom exercises	"more collaborative learning" "mix teams of low and high performance students" "exercises tailored to students needs"
Active participation	Active participation of students	"participation should be taken into account in the evaluation process" "students must be involved and be a part of the whole process, providing their feedback" "students must be able to have a feedback about their learning" " students should be encouraged to search for relevant material or for other sources"
	Active participation of teachers	" teachers must cooperate and provide their assistance"
	Active participation of parents	"parents could also be involves in this process"
	Active participation of other stakeholders	"the school principal, supervising authorities and other stakeholders must provide their active support"
Monitoring		"teachers must use a platform that enables them to check who and for how long have watched the video" teachers must check if students watched and understood with questions in class or by a questionnaire that students will answer after watching the video" " teachers must be sure that everyone has understood"
Accessibility to assistance out of class	from teachers	" teachers may use social media, forums etc. to provide guidance " "teachers could create a FAQs section"
	from other students	students could create social media groups to interact, ask and answer questions" "students could add questions and answers to the FAQs section"
	from parents	"parents could also be involves in this process"

Category	Subcategory	Quotes
Motivation	motives for students	"the teacher must provide motives, some kind of reward especially in young age students" "motives should be according to students' age" "maybe teachers can use a point system"
	motives for teachers	"teachers must focus on the long term benefits" "teachers must be educated on this method and to improve their ICT skills" " less workload for teachers who apply this method" "teachers must be given a bonus" "less and stable teaching subjects and classes for teacher who apply this method in the beginning"
	motives for parents	"parents should be supported if needed"
Planning		"This model should be implemented first in elementary schools so that children become used to it" "students should gain ICT skills from an early age "There must be a central and long term planning by the Ministry" "teachers must plan long term" " a pilot program could be implemented in the beginning" "all interesting parties must be involved from the beginning" " there must be more autonomous and flexible schooling system" "students have to be part of this change so that is less stressful for them" " planning should make sure that all students can participate no matter their backgrounds"
Communicating the model		"Informative meetings for teachers, principals, parents, students must take place before the implementation and also feedback is necessary" " An informative campaign could be launched" "Less stress and anxiety if students know "
Effective time allocation	for students	" change of school timetable" "videos should need the same time as traditional homework"
	for teachers	"teachers must work together" " a collective central action could create the necessary and appropriate material" "two teachers could work in the same classroom"
Funding		" priority should be given from state funding for such actions" "school could attract funding from other stakeholders, sponsors, donations"
Providing means	for students	"students should be provided a laptop by the state and free wifi access could be provided from the municipality according students' economic background"
	for teachers	"teachers should be given the necessary equipment and technical support"

Also, according to the findings, teachers should be offered the opportunity to attend lifelong training programs so that they can acquire the necessary competences to apply this model, such as ICT skills. In addition, students from a young age should attend ICT classes so that they become familiar with the use of ICT in the learning process. Participants also reported that it is essential to provide motives for students, teachers and parents in order to get them engaged in implementing this method. Long term planning, is also vital and this model should be applied from the early school years so that it cultivates the necessary school culture. Furthermore, special attention should be given on how the new model will be communicated to the parties involved, since one of the reasons for rejecting something new is ignorance. Effective time allocation for students and teachers and collaboration can also be part of the solution. Moreover, and of equal importance is to design and apply a monitoring and quality assurance plan for the flipped classroom model. Attracting and securing public funding and if applicable additional private funding is essential in order to provide teachers and students the means to successfully implement this model since it requires access to specific infrastructure and equipment. At the same time, those who implement the model need to be supported as they will have to make substantial and immediate efforts while the benefits of the method will be fully delivered in the long run.

All in all, this study highlighted some aspects of possible solutions that could be selected in order to overcome the challenges that arise from the implementation of the flipped classroom learning model. Since the education system varies from country to country, these corrective measures are indicative and the solution list could not be considered as exhaustive. Also, a more extensive research on the subject that could combine qualitative and quantitative research methods could provide more insight on how learning barriers can be removed since the adoption of the flipped classroom model, though demanding, can be constructive and advantageous for the students and for the society as a whole since it facilitates and supports individuals to acquire the 21st century skills which are essential in a rapidly changing world.

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