

Affordances of Flipped Classrooms: Unveiling the Paradox of Basics and Key Principles of Flipped Learning

Abstract

Flipped classroom is an active, student-centered strategy that has been developed to enhance the quality of the classroom era. For many years up till now, language experts have been seeking better ways to teach and learn. Flipped learning in the classroom that spreads quickly throughout the globe is not well known in our nation. All through the history of teaching and learning, traditional methods have come and gone. Despite traditional methods, modern methods tend to be more of a student-centered, constructivist, inquiry based one. "Flipped learning" is an eye-catching model that has recently become popular. This article seeks to provide perspectives into flipped classes: roles, processes, and step-by-step what really happens inside and outside! That is to attract attention to its potential in education field and provide to make it recognize more by educators and researchers. To this end, it has been tried to clarify the benefits and constraints of what flipped classroom strategy is all about.

Keywords: Flipped learning, flipped classroom, flipped instructions, flipped strategy, new approaches of learning and teaching.

Introduction

What is the flipped classroom?

In educational circles, the “flipped classroom” instructional strategy (also known as the “inverted classroom”) has been receiving a lot of attention. The idea is that rather than taking up limited class time for an instructor to introduce a concept (often via lecture), the instructor can create a video lecture, screen cast, or vodcast that teaches students the concept, freeing up valuable class time for more engaging (and often collaborative) activities typically facilitated by the instructor.

Also it is a type of blended learning that reverses the traditional learning environment by delivering instructional content, often online, outside of the classroom. It moves activities, including those that may have traditionally been considered homework, into the classroom. In a flipped classroom, students watch online lectures, collaborate in online discussions, or carry out research at home while engaging in concepts in the classroom with the guidance of a mentor.

In 1993, Alison King published "From Sage on the Stage to Guide on the Side," in which she focuses on the importance of the use of class time for the construction of meaning rather than information transmission. While not directly illustrating the concept of "flipping" a classroom, King's work is often cited as an impetus for an inversion to allow for the educational space for active learning.¹

Although procedural knowledge is arguably the best type of knowledge to teach using the flipped classroom strategy, the other three types of knowledge—factual (knowledge describing the basic and essential elements a person must know), conceptual (knowledge of the relationship between classifications and categories), and met cognitive knowledge (knowledge about one's own cognition)—can also be taught using this strategy. However, it is important to note that much more time and thought will need to go into employing the flipped classroom strategy.²

Flipped learning provides all in one. First, the learners feel essential and accountable, keeping them as the center. Having the responsibility, the students get engaged and have the opportunity to learn independently. The learners do not feel alienated by having technology included in the teaching atmosphere. Having a more relaxed atmosphere, the students don't feel nervous and have time to interact with the peers and the teacher, to practice more and feel safe when get stuck. Flipped learning all in all provides students the true duty and opportunity to be the true and active learning actors.

The flipped classroom is an innovative variant of student-centered learning with the potential to address the issues raised in the international literature. In a flipped classroom lecture materials are usually assigned as take-home tasks, accessible through online modalities. This allows the lecturer-student class contact time to be devoted to addressing student questions and problem solving in teams (Houston & Lin, 2012; Strayer, 2012). Flipping the focus of class time allows students to take increased responsibility for their own learning through active investigation both in and out of class time. This changes the class time focus and dynamics from the transmission of knowledge to one involving collaborative, interactive learning and just-in-time teaching (Bonk & Khoo, 2014). It provides more flexibility for lecturers and students to participate in discussion and collaborative and guided problem solving activities in ways that are known to address student misconceptions and support the mastery of threshold concepts.

All through the history of teaching and learning, traditional methods have come and gone in search for better ways to teach and learn. Methods can basically be split into two as traditional and contemporary techniques. Modern techniques tend to be more of a student-centered, constructivist, inquiry-based method. The main difference between traditional methods and the modern methods is their reliance on the learner/student or the teacher. The situation for the former is that in the teaching phase it requires the instructor as "everything." Traditional teacher-centered method takes the teacher as the "sage on the stage" (Hamden and McKnight, 2013). With its easiest definition, flipped classroom strategy is articulated as "what is accomplished at school done at home, homework accomplished in home done at class" (Bergmann and Sams, 2014).

The teacher teaches, gives instructions, explains the items whereas the students just stand still and they are just expected to learn. The teacher is the essence, the controller, the center, seems to be all; whereas learners are only passive puppets expected to "know" what is "taught." In contemporary methods / models, the situation is just the opposite. They rely on the student, take the learner as the core, and expect the teacher to lead the way. The students are the real actors in their learning process. As in the famous saying of Confucius "I hear and I forget, I see and I remember, I do and I understand." the real learning only takes place when the learner participates actively in the teaching process. When the students are actively involved in the learning process, they become more aware of and responsible for their own learning, which provides self-confidence, self-awareness, responsibility and autonomy.

Today's students are faced with intensive cognitive challenges. Students are in need to be prepared to solve problems, predict outcomes, and deal with novel clinical scenarios to cope with Bloom's cognitive domain. Moreover, students are in intense need for developing higher order thinking skills (HOTS) as per (White et al., 2017). Various definitions were used by many researchers to define higher order thinking skills. According to (Anderson & Krathwohl, 2001) they mentioned that HOTS is "a cognitive process

¹ From: **Education: An Introduction**. Sam Morris, © 2019 by ED-Tech Press

² From: **Distance Learning: Volume 11 #4**, edited by Michael Simonson,

that involves analyzing, evaluating, and creating in the cognitive domain. Therefore, teaching methods must be adapted to prepare students effectively.

Technology has invaded our lives so much that we cannot even move without it. "While traces of the main components of the ancient techniques still find their way into our range of pedagogical therapy choices, our profession has appeared in an age of knowing a wide range of language teaching environments and purposes and an even greater amount of student requirements, learning styles and affective characteristics" (Brown, 2002).

The flipped classroom strategy advocates tout numerous benefits. Most seem plausible benefits (e.g., time increases for more engaging instruction), particularly for those teaching in hybrid or mixed environments composed of some mixture of F2F (Face to Face) and online instruction; however, the strategy also has its limitations.

First, the quality of the video lecture may be very poor; even though an instructor might be outstanding in F2F settings, he or she may not produce a quality video instructionally and/or technically. Second, taking for granted that all students are able to view the video lecture on their own computers, the conditions under which they might view the video may not be the best for learning any concepts (e.g., a student might view a video while also watching a baseball game and listening to music). Third, students may not watch or comprehend the video and therefore be unprepared or insufficiently prepared for the more engaging activities that will occur F2F. Fourth, students may need a lot of scaffolding to ensure they understand the material presented in the video.

Flipped classroom is not a specified model but a model that educators use by using distinct equipment to compensate for students' requirements. Since teachers in different countries use flipped classroom with different methods, this has resulted in changing the concept of flipped classroom to flipped classroom approach. It is stressed that this fresh method can be used with distinct techniques of teaching (Hamdan et al., 2014).

Key points

Flipped learning is more like a fresh teaching idea and model. Flipped learning is a form of learning that makes use of technology to make learning in the classroom easier and more comfortable and in that way gives the teacher the opportunity to save all class-time into teacher-student interaction instead of lecturing. Flipped teaching gives the teacher extra time to get in contact with the classroom learners, transferring the time of lesson to households through pre-recorded videos.

Flipped classroom approach has four different elements. It is stated that in order to accomplish this strategy, educators must take into account these four components. The properties of this approach which its English correspondence is "Flip" are explained like this by referring first letters:

F (Flexible Environment): It indicates provision of time and place flexibility of learning.

Having a flexible environment, the student's don't feel tense and nervous, don't need to rush to get every detail in a compact lecture, rather based on the flexibility, Students can get assistance from their colleagues or consult with their teacher whenever they want. In the same way, getting rid of the heavy burden to "teach" through a compact lecture got pushed for time, the teachers also feel free to have extra time for other activities, and for real practice Having a favorable, stress-free atmosphere promotes better learning.

L (Learning Culture): In traditional teacher centered approach the source of knowledge is teacher. There is a transition from teacher-centered strategy to student-centered strategy in the flipped classroom strategy.

Rather than being a passive object of teaching, the students are actively involved in their learning process and have the chance to participate in each step. The students have their own way in the process as the core of learning and in this way they learn and understand profoundly.

I (Intentional Content): Flipped classroom educators both think about how education is used to provide fluency and how they can develop cognitive understanding of students.

Deciding on the content and planning the learning process, the classroom time is maximized and much time is left for other strategies, and interaction. This offers more of a better and more efficient time in the classroom.

P (Professional Educator): The responsibility of flipped classroom educators is more than the ones using traditional approach. During the course educators keep continuous observation of learners, and keep track of evaluation of their research and feedback. Deciding on the material, adjusting the materials,

selecting approaches, maximizing interaction time in the classroom, and shortening the classroom are the teachers' roles.

This framework was conceptualized to account for a variety of learning modes, and so its implementation requires the creation of flexible learning environments that may involve, for example, the physical rearrangement of learning spaces and the increased use of digital technologies.

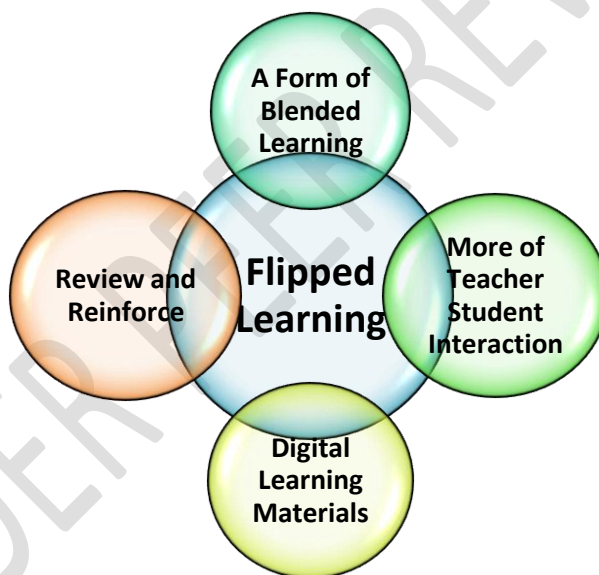
Flipped classes

Using videos has long been in use both in language teaching and micro-teaching sessions of teacher training. Flipped learning, however, is a step ahead of using videos in classes (Strayer, 2012). It emphasizes the difference between previously used methods via computers or educational TVs and inverted classes. It's obviously indicated that, with its periodic and systematic use of interactive techniques in the teaching process, inverted classroom idea is novel.

Flipped classroom strategy is not synonymous with internet videos; the significant point is the interactive activities that take place while teachers and students face each other. Rather than teacher, it's not using video. Students don't work unsystematically. It is not students who spend in front of a laptop all the course duration. It's not about a student who is all aloof while learning.

Flipped courses are locations intended to maximize the interaction time of the classroom rather than the time of lecture. This allows educators as well as learners to communicate more, has more time to use, learn and teach additional strategies in depth (Nwosisi et al., 2016). As seen in below:

Fig. 1 Flipped instruction.

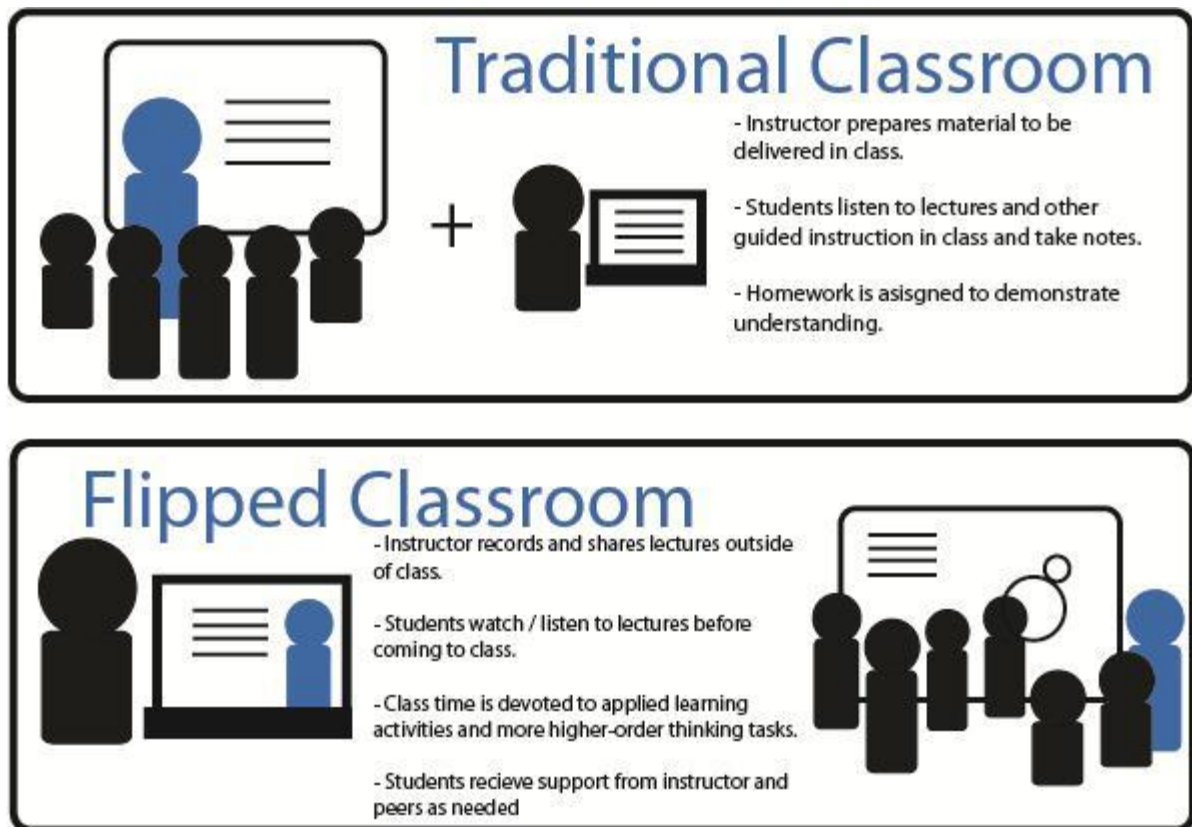


Source: Nwosisi C et. al., A Study of the Flipped Classroom and Its Effectiveness in Flipping Thirty Percent of the Course Content, International Journal of Information and Education Technology, Vol. 6, No. 5, May 2016.

Displayed in Fig. 1 inverted learning simply incorporates the basics of blended learning, digital learning materials, reviewing and strengthening, and more teacher-student interaction.

Traditional classes lack many characteristics that can be offered by flipped classes. Mainly the most significant lack of traditional classes is that they rely so much on teacher speaking time and lecture, so students don't even have the opportunity to speak and communicate. Simply put, there is no need for lessons in a flipped classroom. The students don't feel alone with the job to be accomplished as flipped learning switches "homework at home" and "classroom lecture" to "home lecture" and "class homework" switches. They can get help whenever they want. "The class will be suitable for the constructivist approach because the class time is freed from the didactic lecturing of the teacher allowing a huge variety of activities, group work and discussions that provides an interactive environment for the students" (Basal, 2012).

Fig. 2 Traditional classroom vs. flipped classroom



Source: <https://www.slu.edu/ctl/resources/flipped-classroom-resources.php>

A flipped classroom, therefore, does not necessarily mean flipped learning. There are different interpretations of this approach and associated variations in implementation strategies. For the purpose of this article, we will use the term 'flipped classroom' as defined by the FLN and endorsed by (Bergman and Sams, 2012), to refer to the mode of teaching and learning 'in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive environment where the educator guides students as they apply concepts and engage creatively in the subject matter' (FLN 2014 para. 1).

The Role of Teacher

Teacher role is the most important factor in the flipped approach to the classroom. The roles of flipped classroom educators are presented below;

- Correcting misunderstandings and creating teaching situation based on questioning (Bergmann and Sams, 2012).
- Making one to one interaction with students (Cohen and Brugar, 2013).
- Individualization of learning for each student (Schmidt and Ralph, 2014).
- Use of appropriate learning technology equipment (Fulton, 2012).
- Creating interactive discussion conditions & increasing participation of students (Millard, 2012).
- Sharing classroom lecture videos (Bishop and Verleger, 2013).
- Feedback through pedagogical methods (Nolan and Washington, 2013).

The flipped classroom approach also requires teachers be intentional about their selection of content and so necessitates the evaluation of which content should be taught directly and what materials students should be allowed to initially explore on their own outside of the group learning space. This is evident when a teacher prioritizes concepts used in direct instruction for learners to access on their own, creates

or curates relevant content (typically videos) for students to access, and differentiates content to make it accessible and relevant for individual students.

Finally, the role of the professional educator means teachers are available to students for individual, small group, and whole class feedback in real time as needed, conduct formative assessments during class time through observation, and record data to inform future instruction. With regard to this pillar, (Hamdan et al., 2013) emphasize that instructional videos are not intended to replace teachers—instead, the teacher’s role in a flipped classroom carries additional demands as they must determine when and how to shift direct instruction from the group to the individual learning space and how to maximize face-to-face class time.

In a traditional teacher-centred model, the teacher is the primary source of information; within a flipped classroom, however, a shift in learning culture occurs, as there is a deliberate shift from a teacher-centred to a student-centred approach, with in-class time being used for exploring topics in greater depth and with increased interaction. According to FLN, this results in students being more actively involved in knowledge construction as they participate in learning that is personally meaningful.

The Role of Student

Student approach in flipped classroom transforms from passive knowledge recipient to active knowledge promoter. In this approach the roles of students are expressed below;

- Taking responsibility for their own teaching.
- Watching lecture video as before the course and preparing for the course by using learning materials (Milman, 2012).
- Making needed interactions, receiving and providing feedback with his instructor and friends (Tucker, 2012).
- Participating discussions within class (Overmyer, 2012).
- Participating team working (Formica et al., 2010).

Students are psychologically and physically well prepared for practicing interactive learning. It supports the students to participate, engage and constitute a deep meaning of learning. They should write notes, questions, and comments on the predetermined content. Inside the classroom, they get participated in a positive interactive environment. Students' satisfaction is a very important element in the learning process. Furthermore, successful learning basically meant by satisfied students.

Procedure

It provides an overall look at the basic steps of flipped learning as planning, recording, sharing, focus on the content, and focus on the output.

Step 1: PLAN

When we don't have a plan in place, nothing good ever comes in. Lessons have to be determined which are to be flipped in particular. Once decided, describe the key learning outcomes when the lesson is complete which is needed for the students to be taken away. The lesson plan will be guided by having these goals in place.

Step 2: RECORD

Once the learning goals are outlined, the content can be created. We need to figure out what needed to be delivered after the content has been created. Recording a screen cast is often the easiest way to get started. Make sure everything is included in a regular class lecture which is normally done.

Step 3: SHARE

It's time to share it with the students with the lesson content available for viewing. This is quite easy if we have an effective management system. All we need to do is upload the video and add to the course of students. We can then monitor the activity to ensure that the material is viewed by everyone logging in.

Step 4: CONFIRM

From the learning management system we choose, we will not be able to monitor all student activity in real time, so we should set up a mechanism that confirms that the student has viewed the content. A simple end-of-reading quiz (points added to the activity) is a good starting point. This will also enable us to deliver more effectively on the next step.

Step 5: GROUP & MONITOR

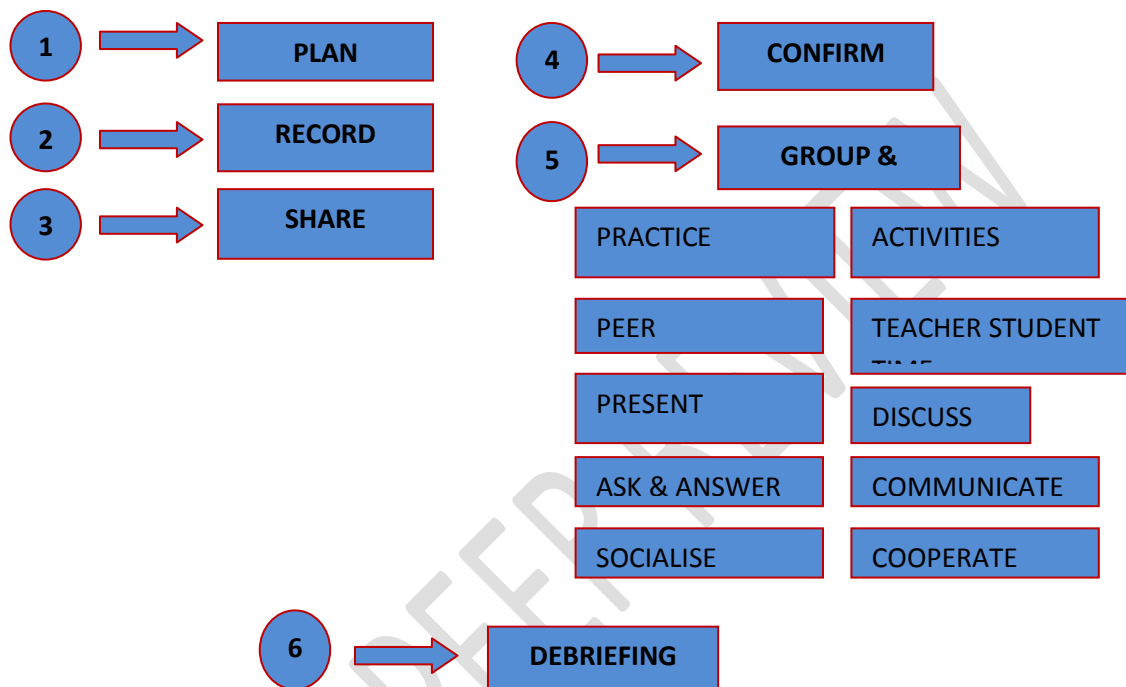
Most of the activities will require us to group the students. Using the results of the quiz, we can now group students with those who may need some additional coaching who have a stronger grasp of the

concepts. Make our self available as the learners go through the activity to provide guidance and ensure progress is made by everyone.

Step 6: DEBRIEF

Bring all teams back together at the end of the event so that we can debrief the main goals presented in Step 1. Ask the learners questions and encourage a debate rather than a lecture.

Fig. 3 Flipping the class procedure



Source: Eda Ercan Demirel, Basics and Key Principles of Flipped Learning: Classes Upside Down, International Journal of Languages, Literature and Linguistics, Vol. 2, No. 3, September 2016.

How can the flipped classroom strategy best be used?

Although there are many limitations to the flipped classroom strategy and no empirical research exists to substantiate its use, anecdotal reports by many instructors maintain that it can be used at any academic stage as a precious learning approach, depending on one's pupils, resources and time learners. Moreover, it seems to be a good fit for teaching knowledge that is procedural, one of the four general types of knowledge described in the revised Bloom's Taxonomy (Anderson et al., 2001).

Advantages of flipping

Flipped learning uses technology to invert the traditional courses. At home, the students watch the videos alone at varying speeds as they like and it doesn't matter how many times they watch. The case is just to get the gist. They decide for themselves. Independent learning is promoted in this way. Flipped teaching fosters peer communication, interpersonal skills, interaction, and collaboration. Flipped learning also provides time for teacher to actively get in touch with the students. Although with flipped learning teachers are not preparing or broadcasting lecture videos but preparing within class activities and integrating them to flipped classroom approach. Unlike what is known, this technique improves teachers' duties rather than relieving them (Lafee, 2013).

Therefore, a flipped classroom video lecture about how to solve a quadratic equation in which an instructor describes and models how to solve this type of problem would be a good use of the strategy. Traditional techniques bring the learners to be educated as passive objects, and the learners feel that way. They feel worthless and believe they must obey what the teacher asks. Flipped learning requires the

learner as the heart, in total contrast to traditional techniques. Since the learners are the core, they feel that they are really accountable for their own learning, which promotes independent learning and student engagement, so they are on the path to autonomous learning. Therefore, "learning" becomes the goal of flipped learning rather than "teaching." A number of researchers have successfully utilized Flipped classroom.

(Williams, 2002) provided a literature review study on the use of internet-based technologies in higher education, concentrating on the key issues and existing problems when transferring courses to an electronic learning environment. The study indicated the requirements of future research concerning teaching and learning on electronic learning environments.

(Hamdan et al., 2013) demonstrated that one way of creating a learner-centred classroom environment is the use of flipped learning model. It is also illustrated that there are qualitative and quantitative research needs for pointing out how the potential of the model can be maximized.

(Kim et al., 2014) suggested further investigation to define design specifications that integrate flipped classrooms with technology and also suggested intensive research regarding the use of technology and superior assessment instruments.

(Travis, 2014) claims that further research is necessary regarding the acceptance of flipped learning as a common pedagogical practice. Although the study of Travis (2014) has shown students' responses regarding one semester in a particular field, more research must be conducted to test the efficacy of flipped learning, such as quantifying the learning of students from flipped learning.

(Butt, 2014) investigated how students' perceptions of the use of class time change after being involved in a flipped classroom structure. Although the results of the study consider student perceptions of learning experience, it makes no comment on the success of the students in obtaining desired learning outcomes of the course. Further research is suggested to study the effect of a flipped learning environment on obtaining learning outcomes.

(Baepler et al., 2014) decreased face-to-face instruction from 150 minutes to 50 minutes a week and found that learning outcomes did not worsen. As a further study, it is recommended that the optimal amount of face-to-face instruction that provides the greatest learning benefit for students be investigated.

(Simpson and Richards, 2015) demonstrated that the effectiveness of flipped learning course designs might be helpful for other faculties in designing courses more effectively regarding learners' needs. Deficiency in investigations concerning flipped classrooms was also emphasized: such as different teaching methods and designs must be used to make effective comparisons among student outcomes for courses. In addition, it is also suggested to determine whether such course designs enhance the level of student comprehension by evaluation of the level of content retention and the ability of students to apply the content.

Conclusion

Flipped courses provide opportunities for the development of more independent students. Future studies could examine the suitability of the flipped classroom approach in other contexts, such as project-based inquiries or it could be used to teach a range of disciplines. Also a flipped classroom approach could be implemented without radically reforming a teaching practice. This may be an encouraging finding for teachers who wish to consider incorporating advantageous aspects of this pedagogy into their teaching and learning practice without abandoning approaches that experience has shown are effective. The findings of studies confirmed the importance of adopting flipped learning in teaching strategies. Additionally, flipped classroom also gives the opportunity to observe the students how well they managed with given tasks and provided positive feedback to be able to continue with difficult and demanding topics. Students practiced the skills more successfully and efficiently. They had the opportunity to communicate and discuss with instructors more deeply about the content. In addition, they should have enough time to attain the basic levels of thinking skills by themselves. The instructors provided the chance for meeting the higher-order-thinking skills and promoting student-centered learning using think-pair share, group discussion, case studies and problem-solving skills. Based on the finding of the present study and the research hypotheses, it can be concluded that utilization of the flipping learning method improved the students' higher-order thinking skills and engagement on post-test than pretest. Also, it increased students' level of satisfaction regarding the learning process of flipping learning than traditional learning. Use of the flipped classroom instructional model in higher education: instructors'

perspectives" illustrated that in-class practice led students' learning into a more positive interactive and more in-depth way, and improved students' higher-order thinking skills.

References

1. Anderson LW, Krathwohl DR, Airasian PW, Cruikshank KA, Mayer RE, Pintrich PR, Wittrock MC. 2001. *Taxonomy for learning, teaching, and assessing*. New York, NY: Longman.
2. Baepler P, Walker J, & Driessen M. 2014. It's not about seat time: Blending, flipping, and efficiency in active learning classrooms. *Computers & Education*, 78, 227-236.
3. Basal A. The use of flipped classroom in foreign language teaching, in Proc. the 3rd Black Sea ELT Conference Technology: A Bridge to Language Learning, November 15-17, 2012, pp. 8-13.
4. Bergmann J, Sams A. 2012. *Flip your classroom: Reach every student in every class every day*. Washington, DC: International Society for Technology in Education.
5. Bergmann J, Sams A. Flipping for mastery. *Educational Leadership*, 2014; 71(4), 24-29.

6. Bishop JL, Verleger MA. 2013. The Flipped Classroom: A Survey of the Research. 120th ASEE Annual Conference & Exposition. Atlanta: GA.
7. Bonk C J & Khoo E. 2014. Adding some TEC-VARIETY: 100+ Activities for motivating and retaining learners online. Retrieved from <http://tec-variety.com/>
8. Brown HD. 2002. English language teaching in the Post-Method Era: Toward better diagnosis, treatment, and assessment, in *Methodology in Language Teaching*, J. C. Richards and W. A. Renanyda, Eds. New York: Cambridge 17.
9. Butt A. 2014. Student Views on The Use of A Flipped Classroom Approach: Evidence From Australia. *Business Education & Accreditation*, 6(1), 33-43.
10. Cohen S, Brugar K. I want that... flipping the classroom. *Middle Ground* 2013; 16(4), 12-13.
11. Flipped Learning Network (FLN) .2014. The Four Pillars of F-L-I-P™. 3/5/2015 <http://flippedlearning.org//site/Default.aspx?PageID=92>
12. Formica SP, Easley JL, Spraker, MC. Transforming common-sense beliefs into Newtonian thinking through just-in- time teaching. *Phys. Educ. Res.* 2010; 6, 1–7.
13. Fulton K. Upside down and inside out: Flip your classroom to improve student learning. *Learning & Leading with Technology* 2012; 39(8), 12–17.
14. Hamdan N, McKnight P, McKnight K, Arfstrom K. 2013. A review of flipped learning. Retrieved from the Flipped Learning Network, 1/5/2015, http://flippedlearning.org/cms/lib07/VA01923112/centricity/Domain/41/LitReview_FlippedLearning.pdf.
15. Hamden N and McKnight P. 2013. A review of flipped learning. Flipped Learning Network, Pearson. [Online]. p. 5. Available: <http://www.flippedlearning.org/review>.
16. Houston M, & Lin L. 2012. Humanizing the classroom by flipping the homework versus lecture equation. Paper presented at Society for information technology & teacher education international conference, Austin, TX.
17. Kim M, Kim S, Khera O, & Getman J. 2014. The experience of three flipped classrooms in an urban university: an exploration of design principles. *The Internet and Higher Education*, 22, 37-50.
18. LaFee S. Flipped learning. *The Education Digest*, November (2013), 13-18.
19. Millard E. 5 reasons flipped classrooms work. *University Business* 2012; 26-29.
20. Milman N. The flipped classroom strategy: what is it and how can it be used? *Distance Learning*, 2012; 9(3), 85-87.
21. Nolan MA, Washington SS. 2013. Flipped out: Successful strategies for improving student engagement. Paper presented at Virginia Tech's Conference on Higher Education Pedagogy, Blacksburg, VA.
22. Nwosisi C, Ferreira A, Rosenberg W, Walsh, K. A study of the flipped classroom and its effectiveness in flipping thirty percent of the course content. *International Journal of Information and Education Technology* 2016; vol. 6(5).
23. Overmyer J. Flipped classrooms 101. *Principal* 2012; 46–47.

24. Roach T. 2014. Student perceptions toward flipped learning: New methods to increase interaction and active learning in economics. *International Review of Economics Education*, 17, 74-84.
25. Schmidt SM, Ralph DL. *The Flipped Classroom: A Twist on Teaching*. The Clute Institute, 2014; 98-104.
26. Simpson V, & Richards E. 2015. Flipping the classroom to teach population health: increasing the relevance, *Nurse Education in Practice*.
27. Strayer JF. "How learning in an inverted classroom influences cooperation, innovation and task orientation," *Learning Environ Res.*, 2012; vol. 15, pp. 171–193.
28. Tucker B. The flipped classroom. *Education Next* 2012; 12(1), 82-83.
29. White PJ, Naidu S, Yuriev E, Short J, McLaughlin JE, and Larson IC. 2017. Student Engagement with a Flipped Classroom Teaching Design Affects Pharmacology Examination Performance in a Manner Dependent on Question Type. *Am J Pharm Educ*. Nov; 81(9): 5931. doi: 10.5688/ajpe5931.
30. Williams C. 2002. Learning On-line: A review of recent literature in a rapidly expanding field. *Journal of Further and Higher Education*, 26(3), 263-272.