

# The Flipped Classroom Approach: A Review of Cognitive Styles and Academic Performances

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Received 04/24/2024  
Review began 06/06/2024  
Review ended 06/17/2024  
Published 07/03/2024

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DOI: 10.7759/cureus.63729

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## Abstract

There has been a surge in the efforts to efficiently improve students' academic performance recently such that their depth of learning as well as their academic attainment is elevated. The identification of the needs and requirements of students is imperative for this to materialize. The classroom setting differs around the globe, with several factors affecting how teaching and learning are conducted. Versatile cognitive preferences among students also play a unique role in the way they acquire education. Active learning is a strategy that challenges the traditional teacher-centered paradigm. One such technique in active learning involves the "flipped classroom," also called "inverted classroom."

The flipped classroom has been introduced as a novel educational technique in numerous areas of learning and has proven to have a more favorable influence. The concept of the flipped classroom is relatively novel in this regard. The idea and application of flipped classrooms and their effect on the academic performance of students with different cognitive styles have been studied by many researchers. Didactic lectures usually take a back seat (as supportive videos) to facilitate student learning in this format. This review aims to examine the mechanisms through which the flipped classroom approach affects the two cognitive styles: field-dependent and field-independent. The online component of the flipped classroom favors the field-independent students and helps them perform better through an in-class session as compared to the field-dependent students. The review further discusses the benefits of the flipped classroom for both field-dependent and field-independent students.

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**Categories:** Occupational Health

**Keywords:** field independence, field dependence, academic performance, cognitive style, flipped classroom

## Introduction And Background

Traditional teaching and learning methods are quite often challenged in the modern era. For decades, giving lectures in a lecture hall to students has been the widely accepted teaching paradigm, with more focus on the teachers instead of students who are expected to sit for hours and listen. Critiques have claimed that this method inculcates passivity among students and the retention of knowledge is very minimal [1]. However, an opportunity is available for practitioners and researchers of education to diversify the approaches, methods, and techniques in delivering knowledge to students as the present student generation is heavily exposed to technology. "Active learning" is one of the approaches that challenge the traditional paradigm centered on teachers. "Flipped classroom", also known as "inverted classroom", is one such approach to active learning. In various disciplines of learning, the flipped classroom has been introduced as a new pedagogical approach and found to exert a more positive impact [2]. Of late, the approach of the flipped classroom has received much attention since it was first introduced in 2011 [3]. The main aim of the flipped classroom approach is to optimize students' time spent with their teachers [4].

In a flipped classroom setup, the preparation for in-class meetings needs to be carried out in advance, and online lectures, often in the form of supportive videos, facilitate this preparation. Also, there is a demand for the involvement of students during the lectures through peer instructions and problem-solving [5]. The use of technology in a systematic way in a flipped classroom both before the class and during the class activities enables the implementation of various activities of learning and is considered a key feature of the flipped classroom [6]. The current data regarding student performance is inconsistent [7-11]. The students' learning performance as measured by course grades, GPA, or standardized test scores has been proven to improve with the use of the flipped classroom approach. One advantage of this method is the improvement gained in the learning performance of students, a key indicator of quality education. The improvement in students' learning performance in the flipped classroom approach can be mostly attributed to active learning strategies [12].

The method and acquisition of learning vary among students, and it is termed as cognitive or learning style. Different individuals may find different modes of study or instructions effective, and hence their learning styles also differ. Although much deliberation has been conducted regarding several models of learning styles, it is clear that during the process of learning, different strategies are adopted by students based on

### How to cite this article

Soma F (July 03, 2024) The Flipped Classroom Approach: A Review of Cognitive Styles and Academic Performances. Cureus 16(7): e63729. DOI 10.7759/cureus.63729

their preferred style of learning [1]. When the teaching methods are tailored according to the cognitive styles of the students, their learning performance is enhanced [13].

## Review

### The model of a flipped classroom

The flipped classroom model involves a blend of traditional and digital learning where the responsibility to study the material, of course, falls on the students. The digital study material might include homework in the form of practice problems and video lectures, while the classroom activities include group-based, active activities of problem-solving that target the thinking skills of higher-order students [14,15]. This is better defined as follows: “The flipped approach inverts the traditional classroom model by introducing course concepts before class, allowing educators to use class time to guide each student through active, practical, innovative applications of the course principles” [16]. The learning difficulties faced by the students could be due to their passive role during the long hours of traditional lectures and one remedy recommended by researchers is active learning [17]. Therefore, the flipped classroom method provides an environment of active learning and a “set of pedagogical approaches that move most information-transmission teaching out of class; use class time for learning activities that are active and social; and require students to complete pre-and/or post-class activities to fully benefit from in-class work” [5].

Owen and Strayer first discussed the topic of the flipped classroom in their paper [18] and cited Baker's [19] work on the flipped classroom and the work on inverted classrooms by Lage et al. [20]. The core concept of these approaches is to flip or invert the work carried out inside and outside of a classroom by moving the work in time and space. So the focus is moved from increasing autonomy, engagement, or centeredness among students. There are many ways in which the traditional approach to a classroom can be flipped. In one of the strategies, the students are directed by the teacher to screencast, video lecture, or vodcast as part of their homework so they can learn the key concepts of the topic being taught. In the classroom, based on the knowledge acquired by students through homework completion, they engage in activities concerned with problem-solving and the teacher facilitates the process [3]. When these activities are performed in groups, it creates small peer learners' communities [21]. Another strategy that teachers might use in flipped classrooms is teaching 'just-in-time' so that teachers can tailor instructions according to the needs of the students, and these needs can be assessed by getting students to fill out web-based questions before the start of the class [22].

The question that arises here is why should course coordinators and teachers flip their courses and classes. The most arguably reasonable answer could be that educators have realized that the most productive time with students is the face-to-face time offered by the flipped classroom approach. However, to some extent, there was also a need for teachers to meet the ever-changing demands of the education field. Over several years, the number of students attending lectures has decreased in universities due to several reasons, including a change in the work habits of the students, a desire for the delivery of education in a flexible manner, and the availability of the internet, which has made high-quality information easier to gather [23]. It is suggested that educators can meet the needs of students with the help of a flipped classroom model. With the help of advances in technology, teachers can quickly produce informative presentations informally and then post them online. This provides students an opportunity to learn whenever they want at their convenience and also saves the unnecessary effort teachers have to put in repeating information to the students to the students again and again [24].

The flipped classroom has been described as an educational technique with two significant parts by Bishop and Verleger [14]. The first part consists of computer technology and its use, such as delivering lectures through videos and the second part consists of involving students in learning activities that are interactive [14]. While designing a lesson for a flipped classroom, there are four main components [25]. First, a restructuring of time and environment by the teachers in which the students will learn flexibly. This is carried out based on the needs and expectations of an individual student as well as a group of students [25]. Secondly, the contents need to be taught in detail by a teacher with an approach that is learner-centered and provides opportunities rich in learning and the activities should be able to reflect a particular culture of learning for the specific student group [25]. Third, the difficulty level of the educational content should be regularly checked by the teachers. Also, teachers should monitor the notes written by students along with students' progress. Teachers should put in their efforts to apply strategies that promote active learning so that the conceptual understanding of the students improves [25]. Fourth and final, the teacher is a professionally qualified educator capable of keeping track of students' learning processes, providing immediate feedback, and assessing the output of the students [25].

Moreover, there are three phases of the flipped classroom in which it can be classified [26,27]. The first phase is known as pre-class learning preparation. In this phase, the students read the study material with the help of a learning platform available online at their own pace. This is followed by the second phase, known as in-class learning activities. In this phase, teachers and students participate together in learning activities by going through the study material in the form of presentations, debates, discussions, and simulations [4,28]. The aim objective of this strategy is to increase learning efficacy by enhancing the teaching quality; therefore, with the help of in-class activities, the understanding of students is reinforced and broadened

[29-31]. The third and last phase is post-class learning consolidation. It helps in enhancing the outcomes of learning by reviewing the study material. It enables students to learn even outside the environment of their classrooms. Students have the opportunity to apply the concepts they have learned in the classroom, fostering collaboration between themselves and their peers [32]. Therefore, evidence suggests that learning in flipped classrooms significantly affects students in different fields [33].

## The impact of a flipped classroom on the learning of students

The flipped classroom method is significantly more effective in comparison to the traditional classroom when it comes to improving the learning performance of students. When the students have unrestricted access to the study material, either in the form of video lectures recorded earlier or presentations, they have an opportunity to learn at a time and place most suitable for them and at their own pace. This could explain why students have a positive perception of the flipped classroom and why flipped classrooms are more effective than traditional classrooms [34]. Another factor affecting the students' learning in a flipped classroom could be the ease of access to the videos so that students can repetitively watch the videos to gain a better understanding of the given topic [34,35]. The opportunity for more active learning in class can also explain the improvement in the understanding of students related to the topic discussed. Peer interaction is also promoted through in-class activities such as group discussions [36]. Moreover, instructors also have more time and opportunity to provide students with feedback during the face-to-face sessions [36]. The learning performance of students in a flipped classroom increases because they have many opportunities to apply what they have learned [35,36].

Another thing that makes flipped classrooms effective is the quizzes taken before the start of face-to-face in-class sessions. With the help of quizzes, instructors can assess what students have learned from the material given beforehand. These quizzes help students recall what they have learned from the pre-recorded material and it has been considered for a long time that prior knowledge is an important factor affecting the learning performance of students [37,38]. Students can better understand the new information when they recall what they learned previously because they can connect the new information with something they have already learned. Moreover, the memory path that leads to the retrieval of prior information becomes stronger. Therefore, on the next occasion, retrieval of this information becomes easy for the student [39]. Additionally, an instructor can identify the misconceptions of the students about the pre-class material. If these misconceptions are not addressed, further learning by the students can be prevented. Instructors can address the misconceptions of the students by either reviewing the pre-recorded lectures or adjusting the in-class plans for teaching based on the performance of the students [36,40]. Learning the material before in-class sessions, recalling the information, and getting concepts in the right way all enhance the learning performance of the students in a flipped classroom.

## Flipped classrooms and students' academic achievement

Performance outcomes of learning are represented by academic achievement, indicating the level attained by students for specific learning goals [41] and demonstrating the competence of students in extracurricular activities as well [42]. In recent years, many researchers have studied the impact of the flipped classroom on the academic achievement of students. Zengin conducted a study to investigate the impact of the flipped classroom on academic achievement and to understand students' opinions about this model [43]. The study observed a two-fold increase in the academic achievement of students in a flipped classroom [43]. Moreover, the study also observed that the learning of students was also facilitated by this approach, along with the visualization of teaching mathematics. Permanent learning was also contributed by the flipped classroom approach [43]. Zhonggen and Wang investigated the effectiveness of a flipped classroom approach and reported a higher score in students who were taught in a flipped classroom environment [44]. Another study was conducted on nursing students to evaluate the effect of the flipped classroom on their academic achievement. Traditional methods were used to teach the control group, whereas the flipped classroom method was used to teach the experimental group. Higher academic achievement was observed in the experimental group in comparison to the control group [45].

## Cognitive styles and students' academic achievement

The procedure through which an individual processes the information and how this affects their performance represents their cognitive style [46]. It can be said that one attribute of individuals that distinguishes them and has been most studied is their cognitive style. The approach through which an individual relates to others and thinks, solves, learns, and perceives things is defined as cognitive style [47]. According to Curry, psychometric qualities have three categories influencing the learning process of an individual. These categories include information processing style, instructional preferences, and cognitive style [48]. This model, though, received much criticism later [49] but still provided an overarching model for learning processes. As per Curry's argument, there is more stability in cognitive style and it possesses more significance when it comes to complex learning [50]. Although it is also likely that new strategies for learning may be developed or adopted by students when there is a difference between their favored cognitive style and the task assigned to them, the role cognitive styles play in the learning process cannot be looked over, especially in the case of the initial phases of the study (51). Cognitive style is a person's inbuilt characteristic that is relatively fixed and preferred [48,51] and consistently, it differs among individuals in the way in which the information is processed and organized by them [52]. Values, attitudes, and social

interactions are also influenced by cognitive styles. In teaching and learning method development, cognitive style is very important [53-55]. Hence, the academic achievement of students is impacted in a better way by the combined presence of cognitive style factors and learning and teaching methods.

The two most acknowledged cognitive styles are “field dependence (FD) and field independence (FI), which are widely used in education research [56]. FI is described as “an analytical, in contrast to a global, way of perceiving, which entails a tendency to experience items as discrete from their backgrounds and reflects the ability to overcome the influence of an embedding context” [57]. It can be said that the capability of some people to extract some parts separately from complex backgrounds is greater, and the FI style tends to be more present in such individuals. Whereas the FD style is preferred for those individuals who are not able to do this easily. Moreover, the ability of a person to perceive a relevant and particular factor or item in a ‘field’ of various distracting articles is FI. The term ‘field’ in general psychology could be perceptual or abstract about a set of feelings, ideas, or thoughts from which an individual perceives relevant subsets specific to that individual. People with the FI cognitive style perceive the items as unrelated or discrete to the ‘field’, whereas people with the FD cognitive style prefer to perceive the whole background [58].

Similarly, when it comes to learning strategies, the cognitive style of an individual tends to require specific behavior. For example, individuals with an FD cognitive style will construct an overall image of the subject field and will not consider the small details [59]. Learning strategies that are passive and global are adopted by FD individuals because format-structure influences them and they require salient cues [60]. In comparison, active and analytical learning is employed by FI individuals because they focus more on the small details than the overall image for information processing [61]. The impact of cognitive styles on students’ academic achievement has been explored to understand this occurrence. A study found that the overall performance of FI individuals was worse than that of their FD-corresponding individuals [62]. Moreover, FD individuals exhibited a positive attitude when it came to social interactions. Therefore, their willingness to collaborate is greater, and they exhibit teamwork attributes as well [63]. Furthermore, another study found that teams with an FD-cognitive style had more group discussions, supported each other, and were more active than their corresponding FI team [64].

## The influence of cognitive styles on the learning performance of students in a flipped classroom

In a flipped classroom, there is a blend of traditional and digital learning. Mostly, the responsibility of learning course material lies on the student, such as watching videos of lectures or practicing problems at home. Whereas classroom activities are more concerned with group discussions involving an active problem-solving thinking process that triggers the thinking skill of higher order during the classroom sessions [14,15]. Moreover, the environment of learning also improves for students with different learning styles in a flipped classroom [20]. Students in a flipped classroom can take charge of their learning pace and master the learning process. This enables students with lower academic performance to obtain a better understanding of the subject matter through discussion in a classroom session, and at the same time, classroom sessions will not become a source of boredom for higher achievers [65]. A study found that the academic achievement of students becomes better in a flipped classroom and the final scores were significantly better for those students with the FI cognitive style in comparison to those with the FD cognitive style [66].

Another study evaluated the academic achievement of English as a Foreign Language students and also investigated the difference in the achievement of the FD and FI cognitive styles among students. The study found a significant impact of the flipped classroom approach on the writing outcomes of the students [67]. These results are similar to the findings of previous research [68-73]. The study also observed that writing achievement improved significantly in students with FI cognitive style when they were placed in a flipped classroom approach in comparison to their corresponding FD cognitive style classmates [67]. It could be due to difficulties faced by students with FD cognitive styles in making a perception of learning material when the teaching method is less structured. Such students require more detailed instructions, explicit descriptions, and guidance from external sources in comparison to students with FI cognitive styles to cover the study material [47].

In a flipped-classroom approach, students with FD cognitive style are not able to attain a balance with FI cognitive style students, especially in online learning, because such activities demand creativity from students and they should be self-sufficient in using proper strategies for learning to make a better understanding of the subject matter to the maximum. Such a situation is more advantageous for FI students because they are more active and self-reliant when it comes to exploring the study material by describing their learning strategies. FI students can also paraphrase the language of the study material into simple language that is easily understood by them. Furthermore, FI students possess the ability to reorganize information from a variety of online sources. They gather detailed information from different sources, like presentations, reading passages, or video lectures, and afterward, they reorganize the data by joining all the gathered information to make a better understanding of the topic. Thus, students with the FI cognitive style can grasp learning material provided online in a much better way than their corresponding classmates with the FD cognitive style [67].

On the other hand, students with a cognitive style of field dependence face many difficulties in properly formulating learning strategies to study online material. Their paraphrasing skills are weak; therefore, the original information remains in its original form. Nevertheless, such students are also not able to restructure the information from online learning sources. They feel pressured when gathering information from different sources, like presentations, reading passages, or video lectures, and often the collected information is disjointed. Besides, the learning progress of field-dependent students is also slow. Extra time is required by them to review the material several times to eliminate any doubt they may have developed. Research suggests that field-independent students benefit more from online learning activities in a flipped classroom compared to their field-dependent classmates [74].

However, the activities in the classroom provide equal opportunities for field-dependent and independent students. Both cognitive style students get the same opportunity to have their confusions cleared on the areas that are troublesome for them at the beginning of the in-class activities. The instructors typically facilitate these discussions. When it comes to resolving student confusion, the instructors prioritize FD students first, as they tend to encounter fewer issues during in-class sessions. This helps in decreasing the gap in the understanding of FD students after their independent study. This way benefits both cognitive styles to be more ready to put together arguments while discussing in groups in classroom activities [67]. The orientation of FD students is beneficial whereas for FI students, it is personal [75]. Different activities for learning are needed by each of the cognitive styles because of social traits and the flipped approach provides an opportunity to accommodate both traits. The flipped classroom approach provides a lot of Spare time in the classroom for knowledge application [76-78], and preferred situations for learning are provided by teachers for both cognitive styles [67].

## Conclusions

The flipped classroom model significantly enhances academic achievement by enabling students to engage with learning materials online at their own pace before class, leading to better preparedness and comprehension during in-class activities. This approach caters to diverse cognitive styles and learning strategies, facilitating personalized learning experiences and improving performance outcomes. Teachers benefit from more effective time management, enabling them to focus on addressing individual student needs and misconceptions during class. This individualized attention helps all students, including those with different cognitive styles, to achieve their full potential. Overall, the flipped classroom model offers a flexible, student-centered learning environment that improves academic success through tailored instructional design and increased student-teacher interaction.

## Additional Information

### Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

**Concept and design:** Fahad Somaa

**Acquisition, analysis, or interpretation of data:** Fahad Somaa

**Drafting of the manuscript:** Fahad Somaa

**Critical review of the manuscript for important intellectual content:** Fahad Somaa

**Supervision:** Fahad Somaa

### Disclosures

**Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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