



## **Flipped Classroom Research: From “Black Box” to “White Box” Evaluation**

Downloaded from: <https://research.chalmers.se>, 2020-09-27 17:11 UTC

Citation for the original published paper (version of record):

Stöhr, C., Adawi, T. (2018)

Flipped Classroom Research: From “Black Box” to “White Box” Evaluation

Education Sciences, 8(1)

<http://dx.doi.org/10.3390/educsci8010022>

N.B. When citing this work, cite the original published paper.

Editorial

# Flipped Classroom Research: From “Black Box” to “White Box” Evaluation

Christian Stöhr \*  and Tom Adawi 

Department of Communication and Learning in Science, Chalmers University of Technology,  
412 58 Gothenburg, Sweden; tom.adawi@chalmers.se

\* Correspondence: christian.stohr@chalmers.se; Tel.: +46-70-832-9954

Received: 25 January 2018; Accepted: 28 January 2018; Published: 31 January 2018

**Abstract:** The flipped (or inverted) classroom model has gained increasing interest among university teachers in recent years. In the flipped classroom approach, students are encouraged to watch short video lectures as preparation for class, and classroom time is dedicated to more active forms of learning. In this editorial, we provide a thumbnail sketch of the origins and concept of the flipped classroom followed by a summary of the contributions to this special issue, which highlight the importance of considering a range of individual as well as contextual factors when implementing and evaluating the flipped classroom approach. Based on this observation, we propose and briefly discuss realist evaluation as a promising approach to evaluating educational interventions and for advancing our theoretical understanding of the flipped classroom. We argue that realist evaluation provides an analytical framework for posing the next generation of questions about the flipped classroom and we encourage scholars to address the questions: “How or why does the flipped classroom work, for whom, and in what circumstances?”

**Keywords:** flipped classroom; inverted classroom; blended learning; realist evaluation

---

## 1. Introduction

During the past few years, we have witnessed an increasing interest in the flipped (or inverted) classroom model among university teachers. This propitious approach to reforming university teaching has been fueled by the growing affordability of educational technology in conjunction with recent advances in the learning sciences. In the flipped classroom approach, students are encouraged to watch short video lectures (often augmented with quizzes) as preparation for class, and classroom time is dedicated to more active forms of learning, such as peer instruction or collaborative problem solving.

Given the burgeoning use of the flipped classroom in higher education, there is a need for a deeper understanding of the opportunities and challenges of this approach to teaching for both students and teachers, its impact on student learning, as well as implications for instruction. While there is a rapidly growing body of research on the flipped classroom, there is, in particular, a paucity of experimental and quasi-experimental studies, longitudinal studies, and studies with a firm grounding in educational theory.

Against this backdrop, *Education Sciences* invited us in 2016 to edit a special issue on flipped classroom research and practice in higher education. The call for papers resulted in five contributions that address the identified gaps in the extant literature different ways.

## 2. Thumbnail Sketch of the Flipped Classroom

The origins of the flipped classroom can be traced back to pioneers like Eric Mazur and his concept of “peer instruction” [1]; Khan Academy’s founder Salman Khan ([www.khanacademy.org](http://www.khanacademy.org)); Maureen Lage, Glenn Platt, and Michael Treglia, who were among the very first to present the concept

of the “inverted classroom” [2]; and Jon Bergmann and Aaron Sams, authors of the early and very popular book, *Flip Your Classroom* [3].

The flipped classroom has roots in both constructivist and social-constructivist perspectives on learning, emphasizing the active role of the learner in constructing knowledge and the importance of scaffolding by teachers and peers. However, these theoretical roots and their curricular offspring, such as in-class collaborative problem solving, are sometimes overlooked in favor of technology-driven activities outside the classroom, such as watching video lectures [4].

The growing body of research on the flipped classroom has paved the way for a few review articles about the flipped classroom in general [4,5], in K-12 education [6], and in specific fields, such as engineering education [7] and nursing education [8].

Still, there is no unified definition of the flipped classroom and different researchers highlight different aspects as central to the concept. Lage and colleagues, for example, simply define the flipped classroom as “events that have traditionally taken place inside the classroom now take place outside the classroom and vice versa” [2] (p. 29). Martin [9] elaborates:

Flip your instruction so that students watch and listen to your lectures (or those of other expert lecturers [ . . . ]) for homework, and then use your precious class-time for what previously, often, was done in homework: tackling difficult problems, working in groups, researching, collaborating, crafting and creating. Classrooms become laboratories or studios, and yet content delivery is preserved.

Bishop and Verleger, on the other hand, argue that the flipped classroom often is more than just a simple reordering of learning activities and can involve enhancements such as quizzes after or during the lecture videos—and quizzes are not part of traditional classroom teaching. Further, their definition of the flipped classroom explicitly requires videos as out of class learning activities, since—according to them—a too liberal definition precludes the possibility to evaluate the effectiveness of the flipped classroom and that “students tend to not complete assigned readings” [4] (p. 12). While the first part of the argument is indeed a challenge, we wonder why Bishop and Verleger draw the line at the use of videos, as if the problem—students not going through the assigned materials as preparation for class—would not exist for videos as well. We argue that this issue represents a larger problem of self-directed learning that is not per se dependent on the medium of transmission.

The problem of defining the flipped classroom is also reflected in the studies in this special issue, as they partly use quite different definitions and understandings of the concept.

### 3. Contributions in This Special Issue

The five articles in this special issue increase our understanding of the opportunities and challenges of the flipped classroom in different educational settings. Three of the articles are situated in a medical education context, one in international business communication, and the final contribution explicitly addresses the appropriateness of the flipped classroom for different contexts.

Burak and colleagues point at the mixed and partly contradictory findings in the existing literature on the flipped classroom, stressing the importance of considering individual, social, and contextual factors, rather than just the teaching method, to explain learning outcomes. Using a sequential, explanatory mixed-method design, they found that undergraduate medical students performed better on the final exam for the flipped format, but students expressed lower satisfaction with their learning experiences compared to the traditional format.

McCabe used a quasi-experimental design to evaluate the efficacy of the flipped classroom in medical education. A comparison of pre- and post-course knowledge revealed better results for traditional teaching compared to using online modules.

Lucardie and Busari examined the efficacy of the flipped classroom model in postgraduate medical law education. They report better performance and higher satisfaction among students in the flipped classroom section compared to those in the control section. However, echoing other researchers,

they also warn against increasing student workload too much and they note that the flipped classroom works best for highly motivated students with good metacognitive skills.

Bechter and Swierczek applied a constructivist-based learning approach in an international business communication course, moving from practice to theory in an online format with residential weeks. They report very positive experiences with this format and stress the importance of physical meetings, particularly for weaker students.

Finally, Simonson argues that the flipped classroom is not suited for all contexts. He provides a set of practical guidelines and a decision matrix to enable instructors to evaluate their teaching context and decide whether and how to apply a flipped classroom approach.

#### 4. From “Black Box” to “White Box” Evaluation

The studies included in this special issue come to varying conclusions regarding the effectiveness of the flipped classroom approach compared to traditional teaching in higher education. Most notably, they highlight the importance of considering a range of individual as well as contextual factors when implementing and evaluating the flipped classroom approach. To put it differently, there are no panaceas in higher education: interventions seldom work everywhere and for everyone. This simple observation has strong implications for what questions to focus on in future research on the flipped classroom. In what follows, we situate such questions within an emerging and promising approach for evaluating interventions, known as ‘realist evaluation’.

Realist evaluation [10] emerged largely as a reaction to the traditional approach to evaluating interventions, using an experimental or quasi-experimental design. Rather than focusing on the question “does it work?”, realist evaluation is more theory-oriented and pivots around questions such as “how or why does it work, for whom, and in what circumstances?” (see Figure 1, adapted from [11]). This shift in analytical focus has been described as a shift from a “black box” to a “white box” approach to evaluation [12].

- 
- For *whom* will the intervention work and not work, and why?
  - In what *contexts* will the intervention work and not work, and why?
  - What are the main *mechanisms* by which we expect the intervention to work?
  - If the intervention works, what *outcomes* will we see?
- 

**Figure 1.** The main analytical focus in realist evaluation.

Innovative approaches to teaching often consist of a mix of learning activities (the flipped classroom is no exception) and a main focus of realist evaluation is to investigate how different learning activities contribute to different learning outcomes through specific learning mechanisms. These learning mechanisms thus explain how or why interventions work (or do not work)—they open the “black box” between learning activities and learning outcomes. Importantly, learning mechanisms may vary across students and they are sensitive to contextual factors [13].

As an interesting example of how contextual factors come into play, consider the observation by Lucardie and Busari (in this special issue) that the flipped classroom often results in an increased workload for students. This finding spawns several pivotal questions: What happens to student learning and satisfaction as more courses use the flipped classroom, but the amount of time a student is able to invest is limited by a zero-sum type of game? Is there a potential first mover advantage that disappears as students attend several flipped courses? Or are there perhaps ways that the flipped classroom can enhance learning without more time on task? These questions are difficult to fully address at a course level. We therefore argue that a key way forward, to gain a better understanding of both the barriers and possibilities of the flipped classroom, is to conduct research on a program or even

university level. Such research is able to consider contextual factors in a much more comprehensive way and evaluate the efficacy of the flipped classroom against the students' whole formal learning context.

Realist evaluation, a nascent approach to evaluating educational interventions, provides an analytical framework for posing the next generation of questions about the flipped classroom. Experimental studies still have their place in future research, but to advance our theoretical understanding of the flipped classroom, we encourage (more) scholars to address the questions: "How or why does the flipped classroom work, for whom, and in what circumstances?"

**Author Contributions:** The authors contributed equally to this paper.

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

1. Mazur, E. *Peer Instruction: A User's Manual*; Prentice Hall: Upper Saddle River, NJ, USA, 1997.
2. Lage, M.J.; Platt, G.J.; Treglia, M. Inverting the classroom: A gateway to creating an inclusive learning environment. *JEE* **2000**, *31*, 30–43.
3. Bergmann, J.; Sams, A. *Flip Your Classroom: Talk to Every Student in Every Class Every Day*; International Society for Technology in Education: Arlington, VA, USA, 2012; ISBN 9781564843159.
4. Bishop, J.L.; Verleger, M.A. The flipped classroom: A survey of the research. In Proceedings of the 120th ASEE National Conference, American Society for Engineering Education, Washington, DC, USA, 23–26 June 2013.
5. Uzunboylu, H.; Karagozlu, D. Flipped Classroom: A review of recent literature. *WJET* **2015**, *7*, 142–145. [[CrossRef](#)]
6. Lo, C.K.; Hew, K.F. A critical review of flipped classroom challenges in K-12 education: Possible solutions and recommendations for future research. *RPTTEL* **2017**, *12*. [[CrossRef](#)]
7. Karabulut-Ilgu, A.; Jaramillo Cherez, N.; Jähren, C.T. A systematic review of research on the flipped learning method in engineering education. *BJET* **2017**. [[CrossRef](#)]
8. Betihavas, V.; Bridgman, H.; Kornhaber, R.; Cross, M. The evidence for 'flipping out': A systematic review of the flipped classroom in nursing education. *Nurse Educ. Today* **2016**, *38*, 15–21. [[CrossRef](#)] [[PubMed](#)]
9. Martin, J. Advancing the flip: Developments in reverse instruction. Available online: <http://connectedprincipals.com/archives/2775> (accessed on 22 January 2018).
10. Pawson, R.; Tilley, N. *Realistic Evaluation*; Sage: London, UK, 1997.
11. Westhorp, G. *Realist Impact Evaluation: An Introduction*; Overseas Development Institute: London, UK, 2014.
12. Astbury, B.; Leeuw, F.L. Unpacking black boxes: Mechanisms and theory building in evaluation. *Am. J. Eval.* **2010**, *31*, 363–381. [[CrossRef](#)]
13. Wong, G.; Greenhalgh, T.; Westhorp, G.; Pawson, R. Realist methods in medical education research: What are they and what can they contribute? *Med. Educ.* **2012**, *46*, 89–96. [[CrossRef](#)] [[PubMed](#)]



© 2018 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).