

Discussion

# To Flip or Not to Flip: What Are the Questions?

Shawn R. Simonson 

Kinesiology Department, College of Health Sciences, Boise State University, 1910 University Avenue, Boise, ID 83725, USA; ShawnSimonson@BoiseState.edu; Tel.: +1-208-426-3973

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**Abstract:** The flipped classroom has been receiving a lot of press lately as a more desirable way to manage the classroom and help students learn. However, flipping the classroom may not be appropriate for every course or every instructor. There may be a time when other active learning strategies are more appropriate to meet learning outcomes, student needs, and instructor capacity. This manuscript will discuss what flipping is and the decisions that an instructor might consider before flipping their classroom which might also enhance their implementation of this and other teaching strategies. A decision matrix is provided to illustrate this process.

**Keywords:** cognitive load; teaching; learner-centered; student motivation

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## 1. Introduction

The flipped classroom has been receiving a lot of press lately as a desirable way to conduct a class and help students learn. A Google search for “flipped classroom” yields “about 653,000 results,” on Google Scholar “about 41,700 results,” and on the on-line education research library ERIC, 388 results—with 372 of those coming in the last five years. The increasing popularity of this system that requires students to perform the lower levels of Bloom’s cognitive domain outside of class and the higher forms of thinking within the classroom, when students can interact with their peers and instructor, may be due to its perceived and demonstrated effectiveness [1–5]. However, flipping the classroom may not be appropriate for every course or every instructor and a cost/benefit analysis should be performed prior to implementation [3,5,6]. Creating a learner-centered experience does not require flipping the classroom and there may be situations where other active learning strategies are more appropriate to meet learner needs, learning outcomes, and instructor capacity [6]. In terms of student success, flipping the classroom may be no better than any other form of active learning and any active learning appears to be more effective than traditional lecture (passive learning) [3,7]. Instructional priorities should be first based on the learner’s needs and the course’s learning outcomes, then the instructor’s needs, current trends, and the amount of content to be covered [6,8,9]. This manuscript will briefly discuss what flipping is and then more extensively focus on the factors that an instructor might consider before flipping their classroom which might also enhance their implementation of this and other teaching strategies.

## 2. Flipping the Classroom

At a minimum, the flipped classroom consists of three components: (1) students obtain most of the course content outside of the classroom; (2) students actively interact with the material, each other, and the instructor in the classroom to complete higher-order learning activities; and (3) students are required to complete out-of-class activities to benefit from the in-class activities [10,11]. Flipping the classroom allows the instructor to better assess and monitor student learning, to teach content, to encourage application of the content, and to help students develop process, or soft, life-long skills [2,4,5,11].

Henderson and Dancy undertook a study to identify why physics instructors were not adopting evidence-based pedagogies and classified the barriers into two categories: instructor and situational factors [8]. Betihavas, Bridgman, Korhaber, and Cross conducted a review of nursing education research and classified three challenges to flipping the classroom, student-related, faculty-related, and operational (similar to situational as identified by others) [12]. O’Flaherty and Phillips conducted a broader review and identified student, instructor, economic, and time considerations [11]. These three had overlapping themes and many similarities. Situational factor examples were content coverage expectations, department norms, and infrastructure [8,11,12]. Illustrations of instructor factors were time constraints, lack of experience, and preferred teaching methods [8,11,12]. Student factors were responsibility, intention, motivation, and resistance [8,11–13]. In addition, Milman corroborates that there are course- or content-related factors to be considered, such as the type and level of the content [13]. Based on these four sources, it is proposed that there are four factor categories to consider when deciding to flip the classroom: (1) the course and the content; (2) situational; (3) the students; and (4) the instructor [8,11–13].

### 2.1. Course and Content Factors

The course or content factor is based on the course learning outcomes, the complexity of the content, and the expertise of the students within the content area [13]. When deciding what pedagogy to use, flipped or not, it has been recommended that teachers utilize backward course design and determine the learning outcomes, student abilities and needs, and relevant assessments before considering content delivery methods and learning activities [9]. If the learning outcomes are that students are simply exposed to content, then flipping may not be the best approach [14]. However, if the learning outcomes are higher order and students are expected to be able to recall and use the content at some future point, flipping may be appropriate [13,14]. Flipped classrooms seem to be best suited to content that is factual or procedural in which students can learn the facts or steps prior to coming to class and spend in-class time practicing using and applying the content and/or procedures [4,13]. Concepts and metacognition can be tackled in the flipped classroom and will require more scaffolding and a more intentional approach to content presentation [13]. Components of course and content, i.e., the expertise of the students, will be discussed in the discussion of other factors.

### 2.2. Situational Factors

Situational factors are those that are pertinent to the institution or department and are typically beyond the students’ and instructor’s control [8,12]. Individual and combinations of these situational factors can play a role in the decision to flip the classroom, use another alternative teaching approach, or remain lecture-based [8]. The instructor should consider instructional norms. For example, instructors may choose to lecture if they feel the pressure to superficially cover a lot of content [8]. And, when in a department where the norm is to lecture, going outside of this may be frowned upon—if the teacher is facing review by others within that department; it may behoove the teacher to meet the norms until a rapport and trust can be established [8]. Traditional letter grading practices, especially in the large class, may also make it difficult to provide the assignments, assessments, and feedback required in a flipped classroom [8]. There may also be insufficient time for change as the instructor may have a large teaching load or high scholarship expectations [8].

Beyond department and institutional norms, socioeconomic considerations may play a role. The most common iteration of flipping requires the use of technology to create and view videos and the financial and resource wherewithal of the community can play a role in being able to produce, curate, and view the videos [2,3,6,11,12,15]. For example, if students do not have reliable access to technology, because of income or residential location, it will limit the effectiveness of the flipped classroom [2,3,5,6,12,13,16–18]. Conversely, a school or district may not have the financial resources or the requisite technology available for video production and web maintenance [2,3,6,11,12,18]. However, technology may not have to be a barrier as other out-of-course sources of content can be used instead,

for example, text or literature readings such as have been used in Team-Based Learning (TBL) for many years [19].

The physical space in which the class meets can be a situation worth consideration as well. While it can be done, fixed stadium seating does make implementing active learning more challenging, especially with large classes [8,20]. Lastly, it may also be worth considering what other courses students will be taking concurrently because if they are enrolled in multiple flipped courses, they may experience a significant workload/time commitment and be unable to keep up with the out-of-class expectations [21].

### 2.3. Student Factors

Students accustomed to passive classroom experiences can themselves present a barrier to change [11,15,22]. They may passively or actively resist participating or stop attending class because it is contrary to their expectations, their work ethic does not support the increased workload, or, more critically, they may not have the requisite skills to accomplish the assigned tasks [2–4,8,13,17,23]. Because this teaching pedagogy may be new to students, a perception may develop that the instructor is not teaching and the workload is improperly distributed—leading to resistance [11,21]. Students may simply not be motivated to do the out-of-class work [2,16,23]. And, even if students do watch the videos, will it be with intention and the motivation to learn the material, especially if students feel that this additional out-of-class preparation creates an undue time burden [11–13,18,21,24]? In addition, because students are unfamiliar with effective group dynamics and have not been taught how to think critically and independently, groups may be ineffective and discussions may quickly get off topic [12]. Additionally, when students do not have the requisite skills, i.e., prerequisite math, language, or background content knowledge, cognitive load can become too great and reduce the potential for success [25]. The students may be so resistant that they may complain to the department chair, provost, or university president [8].

Requiring students to participate in their learning prior to coming to class requires some sort of motivation on the part of the students [6,16,20,23]. The decision to flip a classroom or to choose some other teaching method should consider how much that pedagogy will enhance or discourage student motivation [10]. Self-determination theory suggests that students will feel motivated when they feel competent (that the assignment is within their abilities), autonomous (in control and independent), and related (socially connected to others) [26,27]. If these three conditions are met in and out of the classroom, students are more likely to be motivated and to complete the out-of-class activities [26]. In addition, assignments and activities should be meaningful, that is, students should be able to see the rationale behind them and be able to see how completing them will help them meet their goals [27,28]. This may require that the instructor take time to identify student goals, explain the rationale, and provide assignments/opportunities for students to find the meaning [5,11,21,29]. Furthermore, intrinsic motivation is enhanced when students feel that challenges are fittingly difficult, the feedback is appropriate, i.e., the individual is acknowledged, provides a sense of agency and control, and belittling statements are not used [27]. In contrast, intrinsic motivation is reduced when goals, rewards, threats, deadlines, and high-stakes evaluations are externally established and enforced [27]. Extrinsic motivation is enhanced as well by a sense of belonging, perceived competence, a sense of autonomy (meaning here that completing the activity fits other individual goals and they feel that they have the ability to voluntarily choose to participate), and compliance (doing the activity is required) [27]. Extrinsic motivation is then undermined when students do not value the activity, feel incompetent, and participating in the activity fails to achieve their desired or expected results [27]. While an assessment opportunity can help, it is more beneficial if the motivation can be intrinsically generated out of interest, curiosity, or a “need to know” [6,27]. Preparing engaging in-class activities will increase students’ motivation to acquire the content prior to those activities [6,27,28]. Providing prompts and time for students to reflect on their learning and the connection between the out-of-class and in-class assignments enhances motivation, metacognition, and learning [6,27].

Cognitive load impacts student motivation and success and is the effort required to utilize the working memory to complete a task [25]. Working memory is limited and can be overwhelmed with too much new or extraneous information to process or too many steps to complete when problem solving [30–32]. As learners develop expertise in an area, they develop representative theories or models—known as schemas—that help them make decisions about and use the content [25]. A critical difference between novices and experts is the number and complexity of their schemas [25]. Schema development can be inhibited if the cognitive load is too great, yet well-developed schemas can reduce cognitive load [25].

There are three components of cognitive load: (1) intrinsic load is the core of the problem and is required for understanding and schema development; (2) germane load is that which helps the formation of schemas; and (3) extraneous load is information that is not required for understanding and may actually interfere with learning [33]. The amount of cognitive load depends on three components: (1) learning outcome; (2) learner's prior knowledge; and (3) the learning setting [33]. While intrinsic load complexity increases cognitive load, this is relative to the learner's prior knowledge and subject expertise [33]. Novices have limited schemas to work with; thus, scaffolding to substitute for schemas and tools to help develop schemas are critical [33,34]. However, the same tools that help novices can inhibit experienced learners as extraneous load can enhance schema development and content retention [33]. A well-designed lesson will focus learner attention and activate prior learning—making the relevant schemas available, prior to introducing new content and then encourage elaboration and rehearsal to integrate the new content and modify existing schemas [33]. If students have no prior learning, or developed schemas, the initial content introduction can create a significant cognitive load and limit learning if not appropriately segmented and sequenced [33,34]. In addition, if the content is new and schema development is non-existent or limited, problem solving, as is found in the application exercises common in flipped classrooms, can create a high cognitive load and the problem solving attempts can actually limit learning [25]. Flipping a classroom should optimize cognitive load by allowing students to self-pace their learning, enhance selective attention, identify intrinsic load, increase germane load, appropriately adjust extrinsic load, and promote schema development [10,33].

Because of the high intrinsic load of a complex topic, the flipped classroom may not be appropriate for novice learners as content introduction may be more appropriately completed by other active learning strategies in the classroom. There are four particular situations that may be better handled by other active learning strategies: (1) A new and important concept, particularly a *threshold concept* [35] that students often struggle with but must master in order to continue with the subject [13]; (2) The start of a new unit or topic, to orient students to new ideas, problems, or approaches [13]; (3) A concept where students are likely to be confused or struggle due to inexperience, lack of knowledge, or misconceptions [13]; (4) A classroom in which English language learners are present and will be significantly challenged [13]. In these situations, considerable scaffolding may be required to help students understand the content/concepts [13,32,34]. Other learner-centered active learning strategies that allow the instructor to be present during concept invention, misconception formation or confrontation, and/or threshold concept development may be more appropriate, such as Process Oriented Guided Inquiry Learning (POGIL), simulations, and Science Education for New Civic Engagement and Responsibilities (SENCER) [35–39].

#### 2.4. Instructor Factors

Instructor factors may play the biggest role in the appropriateness for flipping the classroom as their pedagogical, design, and assessment skills will determine the success or failure of the flipped classroom [11,23,29]. While it makes sense that instruction be learner-centered, some instructors may not be ready to make that change [2,11,12,15,16]. Flipping requires that some control be given to the students and this may be threatening and/or uncomfortable for some [2,11,12,16,22]. For example, instructors may “fear looking stupid” by not being in control or unable to address student questions [22,40]. However, it may not just be the fear of looking stupid, but trepidation about change and about forming

deeper relationships with students that can foster hesitation [5,41]. Thus, self-determination theory can also be applied to the instructor and suggests that the instructor will be motivated to try a new pedagogy when they feel competent (that the teaching method is within their abilities), autonomous (in control and independent), and related (socially connected to others) [26,27]. If these three conditions are met in and out of the classroom, instructors are more likely to be motivated and to attempt something new [26]. The instructor who does not feel that they have a thorough understanding of the content—perhaps they are teaching outside of their subject-area expertise—or does not feel comfortable in the classroom, may not feel competent enough to try a new pedagogy, especially one that gives some control to the students. An instructor who is teaching content dictated by others or who is in a department or institutional environment that does not support a flipped classroom will not feel autonomous and will be hesitant to flip their classroom [8]. Additionally, if the instructor does not feel supported or mentored, as if they are on an island by themselves, they will lack the social connection encouraging risk taking [8].

Using a new pedagogy should also be meaningful, that is, instructors should be able to see the rationale behind it and be able to see how using the flipped classroom will help them meet their teaching and/or career goals [27]. This may require that the instructor be provided with opportunities, or take time, to find the rationale, identify their goals, and perhaps work with a mentor/colleague to find a suitable approach [5]. Furthermore, intrinsic motivation is enhanced when individuals feel that challenges are fittingly difficult, the feedback is appropriate, i.e., the individual is acknowledged, and provides a sense of agency and control [27]. Multiple feedback mechanisms beyond student course evaluations and beyond classroom observations by someone who believes that a lecture is teaching, may enhance the motivation to innovate [8]. In contrast, just as with students, intrinsic motivation is reduced when goals, rewards, threats, deadlines, and high-stakes evaluations are externally established and enforced [27]. Extrinsic motivation is also enhanced by a sense of belonging as well as perceived competence, and a sense of autonomy (meaning here that using the flipped classroom fits other individual goals and they feel that they have the ability to voluntarily choose to participate) or compliance (making the change is required) [27]. Extrinsic motivation is undermined when individuals do not value the activity, feel incompetent, and making a change fails to achieve their desired or expected results [27]. Thus, previous success or failure with alternate pedagogies may impact the decision to flip the classroom. Additionally, success or failure with the initial implementation of a flipped classroom will influence the decision to continue the use of the flipped classroom once tried. While external assessment can help, it is more beneficial if the motivation can be intrinsically generated out of interest, curiosity, or a “need to know” about how effective the process is [6,27]. Therefore, the instructor identifying their own assessment tools for determining the success of the flipped classroom is beneficial [42]. Working with engaged and motivated students will increase instructor motivation to flip the classroom and do the additional work to maintain the pedagogy [6,27,28]. Taking time to reflect on their teaching and the connection between student success enhances motivation, teaching, learning, and sustained effort [6,27,42].

Flipping the classroom also requires that the instructor alter their thinking about the purpose of class time—is it for sharing knowledge or for working with learners as they grapple with concepts and apply their knowledge [12,29,43]? Flipping the classroom may also require the use of unfamiliar technology if one is going to record and post video lectures [3,4,12,41]. The training or knowledge as to how to go about changing the pedagogy and developing those out-of- and in-class materials may also present a barrier to changing teaching strategy [2,12,16,44]. The quantity and quality of the out-of-class materials is important and preparing these takes a considerable time and resource commitment [11,21,29]. The use of technology and producing engaging and effective videos is also a skill to be acquired and some will be better at it than others [13]. Changing pedagogies also requires additional time that faculty may not be able to spare—time to make the out-of-class assignments and the in-class activities, provide formative and summative assessment, and work with engaged students [2–4,11,12,18,21,29,45,46]. While assignment time will decrease with ongoing offerings of the

same course, time committed to assessment will remain greater. It is also beneficial to take the time to explain to the students the rationale behind the change and the benefits to the students to increase their willingness to do the extra out-of-class work and participate in class [5,11,12,21,29]. Asking students to do something with which they are uncomfortable, especially with little explanation or scaffolding, can reduce student course evaluations which, in turn, depending on how those evaluations are used within faculty evaluation and reward systems, may increase instructor resistance to innovation [40,47]. Lastly, faculty may be resistant as they want to do what was modeled for them and what inspired them as students, which for many may have been a gifted lecturer [40].

### 3. Making the Decision

Table 1 presents a summary of this discussion and considers the four factors (course/content, situational, student, and instructor) for deciding to flip, or not flip, the classroom. Instructors can use it to establish the relative weight of the factors supporting or opposing the decision to flip the classroom. No scoring or cut-off points are provided as the intent of the table is to get instructors to consider the various factors pertinent to their decision and not to be prescriptive. When choosing to flip the classroom, instructors are encouraged to use the manuscripts found in this special journal issue as well as the plethora of strong resources available elsewhere to design the most effective learner-centered learning experience. When choosing not to flip the classroom, the instructor is encouraged to pursue other active learning strategies that will better meet learner needs. This is also not to say that those items for which “Not to flip” is selected should not take place in the flipped classroom, it is simply that more intentional work may be required and/or that there may be other teaching/learning strategies that are better suited [3,6,13,23,39].

**Table 1.** Decision matrix for balancing the pros and cons of flipping the classroom.

Factor	To Flip?	Not to Flip?
<b>Content</b>		
Presentation of superficial content [14]		X
Application of content [13,14]	X	
Procedural content or knowledge [4,13]	X	
Conceptual content [13]		X
Develop metacognitive skills [13]		X
<b>Situational Factors</b>		
Survey class with pressure to superficially cover large quantity of content [8]		X
Department or institutional norms run counter to active learning [8]		X
Teaching is evaluated by students and/or others who may not value active learning and the instructor is early in their career [8]		X
Department or institutional norms expect/support active learning [8]	X	
Stadium seating in a large class [8,20]		X
Large class with traditional grading expectations [8]		X
Students have reliable access to technology to view videos [2,3,6,11,12,15]	X	
Institution has resources to create and curate videos [2,3,6,11,12,15]	X	
Instructor has time to create in-class and out-of-class activities [8]	X	
Students are enrolled in multiple flipped courses [21]		X
<b>Student Factors</b>		
Motivation		

Table 1. Cont.

Factor	To Flip?	Not to Flip?
Students sufficiently motivated to complete out-of-class activities [6,16,20,23]	X	
In-class activities novel, challenging, meaningful and realistic [28]	X	
Competence [26,27]		
English language is a probable barrier [13]		X
Students have the prerequisite skills and knowledge [13]	X	
In-class activities promote a sense of student ability [26,27]	X	
Autonomy		
Out-of-class assignments provide students with a sense of independence and control [26–28]	X	
In-class activities provide students with a sense of independence and control [26–28]	X	
Relatedness [26,27]		
Students have a sense of belonging in the class [26,27]	X	
Students feel marginalized or alienated [26,27]		X
In-class activities foster interdependence and a sense of belonging [26,27]	X	
In-class activities can be completed via a division of labor [28]		X
Cognitive Load		
Students have, or can develop on their own, sufficient schema to learn and retain content [30–32]	X	
The concept is a new threshold concept [13,35]		X
The content is new to most students [13]		X
Students are likely to struggle with the concepts or there are frequent/significant misconceptions [13]		X
Students are likely to struggle with English or the content-specific language [13]		X
<b>Instructor Factors</b>		
The instructor is okay with giving up some control to the students [2,11,12,16,22]	X	
The instructor has a sufficient grasp of and comfort with the content to be prepared for just-in-time teaching [12,29,43]	X	
The instructor is comfortable working closely with students in the classroom [12,29,43]	X	
The instructor has the time and knowledge to create out-of-class activities [12,29,43]	X	
The instructor has the time and knowledge to create in-class activities [12,29,43]	X	
The instructor has the time and knowledge to create/change formative and summative assessments [2–4,11,12,18,21,29,45,46]	X	
The instructor has the time and knowledge to explain the new process to students [5,11,12,21,29]	X	
Faculty are at a point in their career, and/or at an intuition, where teaching evaluation variability is acceptable [8,40,47]	X	

As previously stated, it is not the intent of this manuscript to create a prescription as to when to flip the classroom; rather, it is to help teachers make an informed decision. The verdict can be to wholeheartedly adopt the flipped classroom or completely utilize passive learning strategies. It may also be to use some combination of the two with, or without, other active learning pedagogies sprinkled in. What that balance of factors in the matrix found in Table 1 is, is up to the instructor as they weigh the pros and cons of each factor within their own situation. Some factors may be of more importance to one individual as compared to another. However, if the majority of the “Not to Flip” factors are not marked and the majority of “To Flip” factors are, the decision may be clearer. Further, an instructor new to learner-centered teaching who has decided to pursue a new pedagogy may want

to start slowly and increasingly add active learning to the curriculum to help themselves and their students adapt and optimize the course experience [5,29]. Mentoring and/or ongoing support is not only beneficial for initiating and maintaining this pedagogical change, but it may be necessary for successful implementation by a wider variety of instructors [4,11]. In addition, sharing with students what is being done and why can increase their willingness to participate and learn with a flipped approach [11,12,21].

Thus, the instructor who is considering flipping the classroom should contemplate the course content and at what level they want their students to understand that content. The situation in which they teach is important as external expectations and resources can make flipping the classroom more or less challenging. Motivating and appropriately challenging students is also critical and worthy of reflection. Perhaps most importantly, the instructor needs to determine their own willingness and ability to change pedagogies. Only when the complex interplay of these factors has been considered can a balanced decision be made and the learner-centered environment optimized.

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