What the Flip: Impact of Flipped Instruction on Self-Regulated Learning

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Abstract:

Flipped instruction, while becoming a more common pedagogical approach is still a nascent area for empirical research. This comparative case study of the use of flipped instruction in two courses - one face-to-face and the other online - by the same instructor examines how flipped instruction can be used differently in different courses. The study examines how students interact with flipped video content and how their use of it supports self-regulated learning. Findings suggest that flipped instruction both requires and cultivates self-regulated learning. Flipped instruction provides temporal 'space' for metacognition and increases student self-efficacy and motivation. While flipped instruction has limitations, it makes online learning more palatable. The paper concludes with recommendations for future research.

Keywords: self-regulated learning | SRL | flipped instruction | reverse instruction | classroom flip | blended learning | inverted classroom

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1 Introduction

In the United States of America, attention to flipped instruction is becoming more ubiquitous. Articles about the approach have appeared in leading practitioner-oriented periodicals, including *Educational Leadership* (Goodwin and Miller, 2013) and *District Administration* (Finkel, 2012). Indeed, flipped instruction has even made its way into mainstream media, such as *USA Today* (Toppo, 2011).

While emerging as a more common pedagogical approach, flipped instruction is still a nascent area for empirical research. Specifically, there is a paucity of empirical research on how students interact with flipped content and the relationship between flipped instruction and student self-regulated learning.

This comparative case study of the use of flipped instruction in two graduate university courses—one face-to-face and the other online—taught by the same instructor illustrates how flipped instruction can be used differently in different courses. The study examines how students interact with flipped video content and how their use of it supports self-regulated learning. Specifically, the study focuses on three research questions:

- How do students interact with flipped content?
- What are student and instructor perceptions of flipped instruction?
- How does flipped instruction influence self-regulated learning?

The study yields a set of considerations regarding student and instructor use of video content and a conceptual model of how flipped instruction promotes self-regulated learning.

2 Literature review

While there is no single flipped instruction model (Bergmann and Sams, 2012), generally a flipped classroom is one in which the content traditionally introduced in class has been shifted to outside the classroom in order to utilize instructional time for engaging content more deeply through student-centered activities such as discussions, inquiry, application, collaboration, etc. (Bergmann and Sams, 2012; Goodwin and Miller, 2013; McDaniel and Caverly, 2010; Strayer, 2012). See Figure 1.

Figure 1. The flipped classroom: A visual representation.

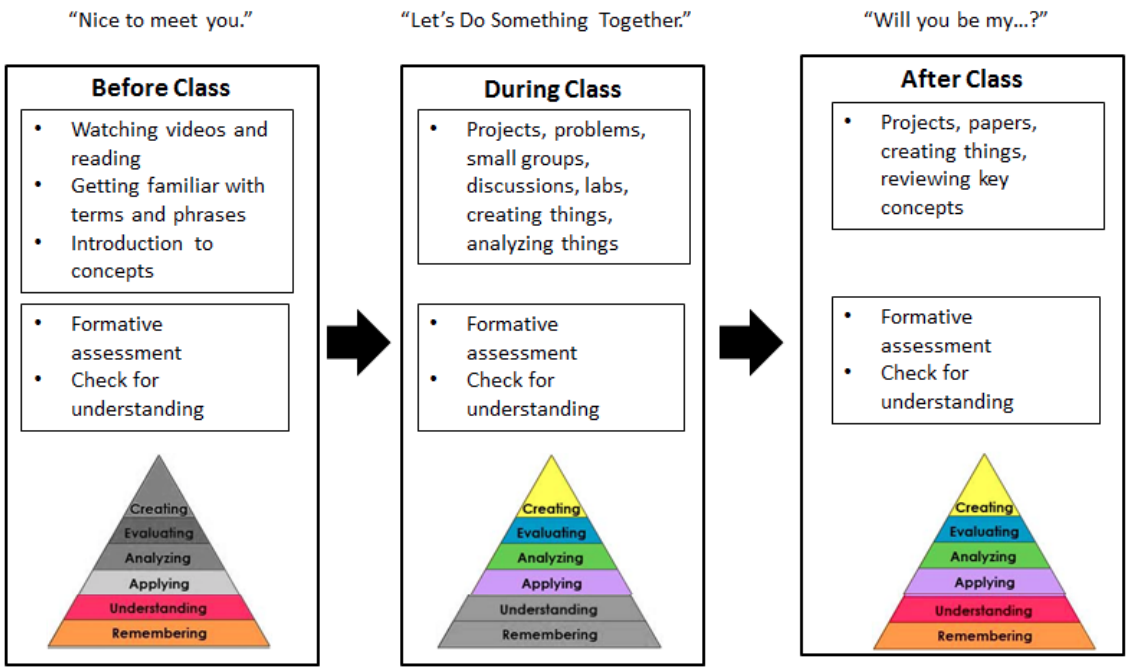


Figure 1: The flipped classroom. A visual representation. Reproduced with permission of the author, Etale (2013). Retrieved from http://i2.wp.com/etale.org/main/wp-content/uploads/2013/02/beforeduringafter-flip.png.

Despite limitations of the flipped approach, which include poor video quality, less than ideal conditions under which students may engage video content, the need for scaffolding of video content, and inability of students to ask just-in-time questions, Milman (2012) concedes that "anecdotal reports by many instructors maintain that it can be used as a valuable teaching strategy at any educational level, depending on one's learners, resources, and time" (p. 85). While there is a dearth of research on the effectiveness of flipped classrooms (Goodwin and Miller, 2013), the research base is growing, and some anecdotal data illustrate impressive achievement gains for students who are taught through the flipped model (e.g., Fulton, 2012).

What empirical evidence there is suggests that flipped instruction has advantages but is no panacea. Lage, Platt, and Treglia (2000) report positive student and instructor perceptions of the use of flipped instruction in economics courses at Miami University. Specifically, students and instructors preferred the flipped approach over traditional instruction. Enfield (2013), in a study of the use of flipped instruction in two undergraduate courses at California State University Northridge found that students perceived the flipped approach to be effective in helping them to learn the content and increasing their self-efficacy by learning independently.

Strayer (2012), in his comparison of a traditionally taught undergraduate statistics course to one taught using a flipped approach, found that students in the flipped classroom were somewhat disoriented by the lack of consistent classroom structure and routine as a function of the various learning activities utilized during class time. Nonetheless, students in the flipped classroom over time became more open to collaboration and innovative instructional methods but struggled more than their peers in the traditional statistics class to discern the nuances and interconnectedness of concepts. Like the students in the flipped statistics classroom in Strayer's study, students in an advanced engineering course that was part of a control-treatment study (Mason, Shuman, and Cook, 2013) struggled initially with the flipped approach, but they ultimately covered more material, scored as well or better on summative assessments, and were more satisfied with the course than students in the control group taught using a traditional approach.

While it could be argued that the "inverted classroom design has been around for decades as teachers have required students to read course material before coming to class and engaging the concepts at a deeper level during class" (Strayer, 2012, p.172), what is perhaps more novel is the use of newer technologies to substantially rethink what students do outside of class time and what students and instructors do with class time (Strayer, 2012). In doing so, the role of instructor during class can shift from that of *sage on the stage* (teacher as lecturer) to *guide on the side* (teacher as facilitator). In this respect, flipped instruction goes beyond serving as a tool to free up class time for other instructional activities to fundamentally reworking the role of the instructor:

Thus while there is literature examining students' perceptions of flipped instruction, this literature based is limited, has yielded varying results, and has not attended adequately to how—specifically—student engagement with flipped instruction influences their learning, particularly self-regulated learning. This study of the use of flipped instruction in two graduate university courses—one face-to-face and the other online—taught by the same instructor examines how students interact with flipped video content

and how their use of it influences self-regulated learning. This study extends the existing literature in two important ways: 1) It examines the relationship between flipped instruction and self-regulated learning; and 2) It explores the ways in which the use of flipped instruction can differ from course to course. The conceptual framework that guides this study—self-regulated learning—is discussed in the next section.

3 Conceptual framework

Self-regulated learning (SRL) has been the focus of close to three decades of research and is strongly associated with student academic success (Butler and Winne, 1995; Hofer, Yu, and Pintrich, 1998; Vassallo, 2013; Zimmerman, 1990). For example, Zimmerman and Martinez-Pons (1986) found that they could predict with 93% accuracy students' track placement in school based on students' self-reported use of SRL strategies.

While there are various theories of SRL, all maintain that SRL is a "self-steering process whereby individuals target their own cognitions, feelings, and actions, as well as features of the environment in modulation of their own learning goals" (Vassallo, 2013, p.240). Self-regulated learners are those who are "metacognitively, motivationally, and behaviourally active participants in their own learning" (Zimmerman, 1990, p.4). *Metacognitively*, SRL involves planning, goal setting, organization, self-monitoring, and self-evaluation, allowing learners to be "self-aware, knowledgeable, and decisive in their approach to learning" (Zimmerman, 1990, p.5). *Motivationally*, self-regulated learners have high self-efficacy, which refers to "individuals' beliefs in their capability to accomplish a specific task" (DiBenedello and Bembenutty, 2013, p.218). Additionally, self-regulated learners are "self-starters who display extraordinary effort and persistence during learning" (Zimmerman, 1990, p.5). *Behaviourally*, SRL involves strategic actions, such as creating environments conductive to learning, seeking out assistance and information as needed, self-instructing during initial learning, and self-reinforcing learning during performances of mastery (p.5). Further, SRL involves adaptation, responding to learning obstacles by, for example, adjusting goals or inventing strategies (Butler and Winne, 1995, p.245) and a spiral "self-oriented feedback loop [that] begins with implementation and use of a certain self-regulated learning strategy or method with the simultaneous monitoring of its effectiveness" (Nodoushan, 2012, p.4).

While there is evidence that SRL knowledge, skills, and dispositions can be taught, research on such efforts is uneven and incomplete (Zimmerman, 1990), and "there is concern that many students, even college students and adults, do not become self-regulating learners and that we know very little about the naturalistic development of self-regulated learning or about formal interventions to increase self-regulated learning" (Hofer, Yu, and Pintrich, 1998, p.57). What evidence there is suggests that modelling, direct instruction, facilitation, and "providing students with opportunities for choice, control, influence over assessments, and peer collaboration [have] been shown to invite student SRL" (Vassallo, 2013, p.244). Additionally, research (Bergamin, Werlen, Siegenthaler, and Ziska, 2012) shows that learning flexibility—in terms of time, teacher contact, and content—is positively related to increased SRL.

This study does not position flipped instruction as an intervention for increasing SRL, nor was the purpose of either course specifically to increase SRL. Rather, this study

examines the intersection of flipped instruction and SRL and considers how flipped instruction influences SRL.

4 Design of the study

4.1 Methodology.

The study utilizes a comparative case method (Stake, 1995) to examine the use of flipped instruction in two graduate university courses taught by the same instructor. Case methodology is the "method of choice for studying interventions or innovations" (Lancy, 1993, p.140). This study utilizes a multiple-case, embedded approach (Yin, 2002), meaning that each case involves more than one level of analysis (student level, instructor level). This approach allows the research team to more robustly probe "how and why" questions in multiple contexts (Stake, 1995; Yin, 2002). Using multiple-case design can promote generalizability in different contexts (Yin, 2002). Additionally, case method promotes theoretical generalizability (analytic generalizability) "based on the development of a theory that can be extended to other cases or refined in light of them" (Eisenhart, 2009, p.59).

4.2 Courses

Two graduate courses in educational leadership at the University of North Carolina Greensboro were used as the cases for this study: *Critical Perspectives in Education, Leadership, and Culture* (referred to subsequently as ELC 700) and *Statistics and Basic Quantitative Methods for Educational Leaders* (referred to subsequently as Stats).

ELC 700, taught online in this study, is the first course that students take in their Educational Specialist (EdS) program, an advanced graduate degree beyond the Masters that is completed prior to entry into a doctoral program in educational leadership. The EdS program leads to a superintendent's license in the state of North Carolina.

Hewitt taught the ELC 700 section used for this analysis in Summer, 2013. As part of a new *low-residency* (online coursework with two intensive weekend experiences during the term) EdS program, Hewitt redesigned the course as an online course and incorporated flipped instruction into the design. While Hewitt had taught online courses previously, this was both a new design for the course and Hewitt's first time teaching the course. The course included asynchronous activities (e.g., discussion board, blogs, and formative assessments) as well as weekly small group synchronous activities using Google Hangout and whole-class synchronous meetings using Blackboard Collaborate. Nineteen students completed the course.

All students in the doctorate of educational leadership program must take at least one statistics/quantitative methods course as part of a four-course research methods sequence; Stats fulfils this requirement. Hewitt designed this face-to-face course, which incorporates a flipped instruction design, and it was first taught in Fall, 2012. This was Hewitt's first time teaching a statistics and basic quantitative methods course and her first time using flipped instruction. Thirteen students completed the course.

In both courses, Hewitt used short (5-15 minutes) instructional videos to flip instruction. She coined the term Video Mini-Lessons (VMLs) to refer to these videos,

which she made herself using a number of tools, including screencasting software (e.g, Camtasia), iPad apps (e.g., Knowmia), and the iPad video recorder. In each course, students were assigned weekly VMLs to view prior to coming to class each week. The VMLs allowed Hewitt to shift some segments of instruction from class time in order to free up instructional time for collaboration, inquiry, discussion, addressing student questions and misconceptions, etc.

4.3 Data sources

There are three data sets from each course examined for this comparative case study: 1) survey data about flipped instruction from course evaluations; 2) student interviews conducted by Zilonka; 3) instructor interview conducted by Journell.

4.3.1 Survey data

For each course, several items—including both Likert-type items and open-ended items—regarding flipped instruction were included in the course evaluation instrument. For ELC 700, 14 of 19 students responded to the survey (73.4% response rate). For the Stats course, 13 of 13 students responded to the survey (100% response rate).

4.3.2 Student interviews

All students from both courses (19 for ELC 700 and 13 for Stats) were invited to participate in an interview regarding their perceptions of the use of flipped instruction in their course. Zilonka interviewed a total of six students (four from Stats and two from ELC 700) regarding their perceptions of flipped instruction. Interview questions focused on students' viewing habits and use of VMLs and views on the usefulness of VMLs as an instructional tool (see Appendix A for the Student Interview Protocol). Interviews were approximately 20-50 minutes in duration. All interviews were audio recorded and transcribed by Zilonka.

4.3.3 Instructor interview

Journell interviewed Hewitt regarding her use of flipped instruction in ELC 700 and Stats (see Appendix B for the Instructor Interview Protocol). The duration of the interview was approximately 80 minutes and was conducted prior to the student interviews. The interview was audio recorded and transcribed by Zilonka.

4.4 Research questions

Three research questions guided the study. Table 1 includes the research questions and data sources analysed to answer each question.

Table 1 Research questions and data sources

Research question	*Data source(s)*
How do students interact with flipped content?	• Student survey data • Student interviews
What are student and instructor perceptions of flipped instruction?	• Student survey data • Student interviews • Instructor interview
How does flipped instruction influence SRL?	• Student survey data • Student interviews

4.5 Positionality

Positionality is neither inherently beneficial nor problematic; rather, it is a matter of fact in all research and has important implications for knowledge-generation: "Knowledge is valid when it includes an acknowledgement of the knower's specific position in any context, because changing contextual and relational factors are crucial for defining identities and our knowledge in any given situation" (Maher & Tetreault, 1993, p.118). As such, positionality must be candidly identified and reflexively considered throughout any research project. The research team was mindful of Hewitt's positionality in her roles as instructor of the courses being studied and as a member of the research team. In order to minimize potential bias as a function of this positionality, Zilonka recruited student interview participants and conducted, recorded, and transcribed interviews, assigning pseudonyms for each participant. Additionally, Journell developed the instructor interview protocol and conducted the instructor interview of Hewitt. Throughout the project, Hewitt reflexively attended to her positionality, and the findings are consensual.

4.6 Delimitations and limitations

The key delimitation of this study is that all data sets (surveys, student interviews, and instructor interview) provide perceptual data. Data on student performance is not included. All data were collected after the courses were completed. The study has two main limitations: 1) Samples are small; the two courses involved in the study served a total of 32 students; and 2) All participants in the study are graduate students.

4.7 Analysis

Using a process that combined *a priori* and open coding (Schwandt, 2001), all qualitative data were first coded by Hewitt and then reviewed by Journell and Zilonka in a peer debriefing session (Carspecken, 1996). A priori codes were drawn from the conceptual framework of Self-regulated learning (e.g., codes for *control over learning*; *metacognition*; *monitoring and self-assessing learning*; etc.). Additional codes emerged during an iterative coding process (e.g., *viewing habits, usefulness, limitations*, etc.).

Numerous memos (Yin, 2011) were developed during the coding process: a) process memos were used to document coding processes and decisions; b) analytic memos identified emerging themes, raised questions about the data, and documented researcher ideas; and c) positionality memos attended to Hewitt's role as both instructor and researcher. Additionally, basic descriptive statistics were performed on quantitative survey data.

5 Key findings

5.1 Instructor and student use of flipped instruction

5.1.1 Different use by course

The use of flipped instruction differed substantially between the two courses. The Stats course VMLs were mostly content-related, although a few were logistical in that they introduced students to course related items, such as the syllabus and various aspects of the course Blackboard site. (Go to https://sites.google.com/a/uncg.edu/elcstats2014/video-mini-lessons-2 for access to VMLs). The use of VMLs for ELC 700 was more varied. Each of the 10 weeklong online modules began with an introductory VML (see http://www.youtube.com/watch?v=f3X2IVm1z98&feature=youtu.be for an example), and additional use of VMLs fell into three main categories, as explained by the instructor:

> One was to help them figure out how to do stuff with technology [e.g., Google Hangout, Blackboard's Collaborate, etc.]. That was almost all screencasting. The second was to remove the logistical stuff [from synchronous meeting time]. For example, whenever I introduce an assignment, and this is in any class now, I always have an assignment sheet and a rubric, and then I have video mini lessons with a screencasting of me walking through the important things, highlighting them and walking through it, and I feel it's been so effective that I do it in every class now . . . [also] I would give an individual feedback on assignments, but I would also give group feedback, and I would do it through screencasting as well. And so then the third thing was actually content—the content videos were very much fewer in 700 than in Stats class, so for example, there was a content one about Critical Theory.

While the types of VMLs used in each course differed somewhat, in both courses the flipped model worked to leverage video content to shift instruction that did not require the professor to outside of class time (asynchronously) so that those activities that were best conducted in class or synchronously online—collaboration, discussion, etc.—had the time needed. (Instructor)

This finding regarding how flipped content varied between the courses speaks to the multiplicity of ways in which flipped content can support pedagogy.

5.1.2 Students' viewing habits

Generally, students reported viewing all VMLs and pausing in their viewing to take notes and/or process the content and then rewatching VMLs as needed:

> Yeah, most of them I took notes and stopped, because my time is so limited, so the beauty of the video, too, it gives you the chance to take notes, and really digest the information, and go back a little to portions that you might have missed. (Interviewee 4, Stats)

Students reported two types of rewatching: a) immediately after initially viewing the VML, to ensure comprehension; and b) rewatching to review before exams or projects. Interviewee 1 (Stats) described the iterative process of watching and rewatching that she used during initial viewing:

> Usually the first time I watched it I would take notes on the video . . . I had to pause and rewind, in order to take notes on ideas, and so it would take me longer to watch the first time, because I'd go back and forth to write things down. So I listened to certain parts several times, but then after that, I don't think I went back and watched the whole thing again. I think I watched pieces of certain videos multiple times. (Interviewee 1)

This student continually assessed his understanding (*metacognition*) and adjusted his *strategic actions* accordingly. Interviewee 5 (ELC 700) used the VMLs to

> Refresh my learning and also to revisit the resources for my writing because I remember, you know, that one video clip was on a particular topic we were talking about, and I said, "Oh, there's a mini video clip on that. Let me go back on that and watch again," and maybe there's information that I can get, on whatever I am writing on or whatever I'm doing, so it helped not just as a learning tool, to refresh my learning, it helped in the sense that it also helped me to use as a good resource for other areas.

This student revisited VMLs to refresh her learning and also to inform her writing. In this respect, the student saw the VMLs not just as a source for initial learning but also as a tool for subsequent academic work.

Students most often viewed VMLs on a laptop at home, but some students watched VMLs at work. A couple of students watched some VMLs on a tablet or smartphone. Students reported appreciating the flexibility (*control over learning*) regarding when and how they viewed VMLs. Interviewee 5—a principal—spoke of being able to watch VMLs in the precious minutes between various administrative duties, just as she was able to fit in her interview for this project:

> Sometimes, like this time of the year, between—okay, school is out, kids are gone, and my next activity at work—like how we are doing [this interview] right now—I can take a moment to log on and watch the videos.

This student viewed VMLs in the cracks of time between other activities. This is an interesting element of viewing habits that reflects the fact that our EdS students are all full-time administrators in busy, demanding, and highly visible roles.

5.2 Usefulness of flipped instruction

Throughout the interview and survey data, students and the instructor lauded the usefulness of flipped instruction in both courses. When asked to what degree viewing the VMLs was an effective use of learning time, Interviewee 5 (ELC 700) replied:

> Well, it was effective enough to watch all of them. Honestly, if I didn't find it meaningful or useful or anything, I'd have probably stayed with the readings that she gave, but I thought it was interesting and so it definitely was useful for my learning. You know, it definitely was.

Thus the testament to the usefulness of the VMLs was in the fact that the student chose to view them all.

The instructor noted that both courses received "very, very positive course evaluation data—both about the course and about me as the instructor" and perceived three main benefits of flipping:

> It was being able to free up class time for other stuff that you can't do outside of class, like the discussion and inquiry and collaboration, so that was one thing, and secondly was that idea of having content that students could access and re-access whenever they needed it. I think that was really helpful, and then the third thing was being able to know that students can do stuff, kind of like without me there.

Students claimed that flipped VMLs increased their learning, improved their confidence, and allowed control over their own learning. Further, their use of flipped instruction promoted student metacognition and increased motivation. Each of these themes is explored in the paragraphs that follow.

5.2.1 Perceptions of increased learning

A powerful theme throughout the data was the notion that flipped instruction—through the use of VMLs—increased student learning by making the content more accessible and more comprehensible. Interviewee 3 (Stats) explained:

> [Flipped instruction] gives the learner the flexibility to use that style of instruction presentation at their own time, at their own pace. It allows you go back if you need to go back . . . It also gives you the ability to go back and review for your test. It helps you also to understand and be able to apply what you've gathered, because if you are consistently being able to revisit it, you are able to process it a little bit better, and when you are able to process it, then you are able to take it from just the processing level to the . . . applying level of knowledge . . . by using it we gained—the learner gained confidence. I gained confidence in the material. And by gaining confidence I had felt much better when I was synthesizing a certain product from the materials that I've learned—I personally would have struggled because it's a lot of material that is not within my comfort zone, as an adult learner who has been out of undergraduate for many, many moons, and out of statistics class, I mean my last math class was my senior year when I took calculus . . . so I think it would have been very, very difficult for me to be able to grasp the concept. I think it would be even more difficult for me to understand

> and go home and struggle with the practice. The traditional model of teach and then go home and do the homework—if I didn't master it in class, if I didn't have the VMLs to come to class and really practice and wrap my brain around the material, I think I would have really struggled because often times I was asking questions in class, I was reaching out to my peers in class, working in collaborative groups, where we could really struggle with it but we were struggling with it in a good, controlled environment of the classroom with the teacher's support . . . I'd say the VMLs turned out to be really, really helpful.

Interviewee 3, who had not had a math class since his senior year, claimed that the flipped approach not only improved his learning of course content but also made him a better learner, capable of higher levels of cognition. Part of what made this possible is the flexibility of flipped instruction and the ability to revisit content as needed. By increasing learning, the student's confidence was then increased, which the student felt was important in synthesizing learning. Further, this student felt that traditional instruction—learning in class and practicing alone at home—would not have been effective. He feels he benefited from being able to struggle through the content collaboratively in class with peer and instructor assistance. Thus, it was not only the VMLs themselves that assisted learning but the fact that their use in a flipped model made space for collaborative, instructor-facilitated learning in class.

Interviewee 6 (Stats) perceived that flipped instruction made content more accessible, more comprehensible, thus making the course easier; when asked how the course would have been different without the VMLs, the student responded simply, "I think it would be much more difficult, much more difficult." Similarly, Interviewee 2 (ELC 700) responded this way to the same question:

> I can't imagine taking it without the VMLs, particularly because the class was an introductory class for the whole program . . . I think it would be pretty challenging to have that class without the modelling and the scaffolding and the VMLs.

Interviewee 4 (Stats) explained that as a teacher who had not had a math course in many years, Stats was intimidating to her, and the VMLs helped her comprehension of the content more so than the textbook:

> I am a teacher, and that was perhaps the most difficult class I have ever taken in my entire life . . . And those VMLs facilitated my comprehension so much more than reading the book, the textbook. So I think for me it was extremely useful . . . because it was recorded you could replay the pieces that you didn't get, so there were things in the readings that I did not fully comprehend and I was able to go back, watch the video, take notes, and then finally, I just—I got it. So it really helped the process of acquiring the material in a more thorough way.

Survey results from ELC 700 indicated that students felt that the flipped use of VMLs was important for their learning: 86% (12) of students perceived that VMLs were "very important" for their learning, while 14% (2) students perceived that as somewhat important (see Table 2).

Table 2 Importance of VMLs as a learning tool

Item: as a learning tool, how important are VMLs?		
Response	*Response count*	*%*
Not at all important for my learning	0	0%
Somewhat important for my learning	2	14%
Very important for my learning	12	86%
Total	14	100%

One survey respondent stated, "LOVED them! Some I have watched many times, especially when I wasn't clear on something or when I needed additional time to grasp the content."

On the Stats survey, in response to the open-ended item, "What aspects of teaching do you feel were especially good?", five of 12 respondents specifically mentioned VMLs, as in these examples, "The VMLs were a great teaching and resource tool," and "I feel that the video mini-study lessons helped explain the overall concept covered in the readings." Thus for a substantial segment of the students, VMLs were a key component of instruction.

5.2.2 Confidence

Not only did the use of flipped instruction increase learning, but it also increased student confidence. Interviewee 2 (ELC 700) watched each VML twice to be confident that he was following the instructor's directions and meeting her expectations. Interviewee 4 (Stats) perceived that the VMLs helped her to feel more confident about the difficult and abstract math content, especially given that math is not her background or strength:

> [Flipped instruction] gave me more self-assurance because I was very insecure in the beginning of the course of my own skills in math and abstraction with studies that I haven't done in so long. I haven't been in a math kind of class or a course that required so much math and abstract thinking for so long, that the videos gave me that opportunity to review and think and rethink aspects of the whole class that I couldn't otherwise—that I wouldn't have had the opportunity to process.

The VMLs gave her more confidence by providing her with control over her learning through the opportunity to revisit and rethink content. Because the VMLs allowed for flexibility, they promoted student mastery of the content, which also made Interviewee 3 (Stats) more confident about the content:

> I think [flipped learning] gave me the capability to be more flexible. If I don't have this flexibility, it's really, really hard to grasp the concepts sometimes. For example, taking the ERM [Educational Research Methodology] class that had a lot of similar

> content, I struggled with that class. This one, I came out of Dr. Hewitt's class a lot more confident, and I think part of that was because I had the flexibility to go back and review the video mini lessons and had the confidence to go back to anything I did not understand.

This same student reported feeling more confident for quizzes, projects, and even for his comprehensive exam:

> It was great for when I wanted to do a review for a test or a quiz. It was great, for example, if I was reviewing something that week, and when I was working on a project, it was great to go back and look at them, so I could make sure I was doing it right, when I was working on a project. I'll be honest with you, it was great for me when I did my comps—not so much the VML but I felt much more confident when I was reviewing my dissertation for my comps. That was a quantitative dissertation and it was using a multivariate regression model, and it gave me the ability to go back and say all right, I feel confident, and I know what regression is.

In this example, a student's use of the VMLs extended far beyond the course itself and helped him to feel confident about and prepared for his comprehensive exam.

5.2.3 Metacognition

VMLs supported metacognition by providing a temporal space for students to assess their understanding. A number of students reported pausing during or after a VML and considering how well they comprehended the content. As needed, students would take notes, rewind, or rewatch a VML in its entirety. Interviewee 2 (ELC 700) would also seek assistance from the instructor as needed:

> I watched them, and then I would reflect. I am all over them, processed what she's saying, ensured that I did not have any questions, and normally what I would do, if I had questions, I would probably text her [instructor].

For this student, metacognition was part of his process of interacting with VMLs, and he would seek out assistance whenever he felt he did not fully comprehend. Interviewee 4 (Stats) indicated that, depending on her assessment of her understanding of the content, she would sometimes watch a VML and quickly move on, while other times she spent additional time processing and reflecting:

> It depended on the material. When I watched the video, if I was totally comfortable, I moved on, but if I wasn't, I reflected on my notes and then made sense of it.

Interviewee 3 (Stats) illustrates how students can use VMLs to promote metacognition:

> I am a reflective person . . . I am a quick, move on type of person. If I got it I would move on quickly, but most of the time with the VMLs I would reflect on them . . . and I would think about it, you know. It wasn't uncommon, I know she would have a mini lesson that would oftentimes be broken into three parts . . . and then I would stop after

> the first part and kind of reflect on it and say, "OK this is how it works." At that point I might rewind it to go back over it, or I might say, "OK, I got it," and move to the next one and do the same thing . . . often times I just paused and said, "Hold on, let me make sure I got this before I move on to the next one."

This student's self-talk demonstrates active metacognition—reflecting and self-assessing to determine if more attention to the content (e.g., rewatching) is warranted before moving on. Also, this interviewee illustrates the relationship between being able to pause and the opportunity to think/consider/reflect on learning. In other words, the nature of VMLs, with their ability to pause and be controlled by the learner, provides a conducive environment for metacognition. The nature of VMLs supports metacognition by making space for it (temporally) according to the student's needs. This is not the case during live, face-to-face instruction.

5.2.4 Motivation

Students revealed multiple relationships between flipped instruction and motivation. First, having recorded content provided them with control over their own learning—the ability to watch when and where they wanted using a device of their choice; to pause, take notes, rewind, and rewatch as they saw fit; and to use the content to cement their learning and review before tests/projects. This control over learning positively influenced motivation. Interviewee 3 (Stats) explained:

> It definitely influenced my motivation because by giving me the flexibility it gave me the ability to fit it in my schedule more effectively. And not having to squeeze something in, I could actually take my time and enjoy what I was learning.

For Interviewee 3 (Stats), the VMLs provided *control over learning*, which influenced his enjoyment of the content and his *motivation*. In this respect, two elements of SRL appear interwoven.

Second, because the VMLs were perceived as useful or interesting, they were motivating. As discussed earlier, Interviewee 5 (ELC 700) admitted that she would not have viewed the VMLs if they had not been interesting or useful. Because they were engaging, she was motivated to view them.

Third, students who considered themselves visual or auditory learners perceived that the VMLs were motivating. When asked about the extent to which the VMLs influenced her motivation to learn, Interviewee 5 (ELC 700) responded:

> Oh absolutely. Because it wasn't only texts, and you know, just for me, you know . . . I am a visual learner as well, so I do like to watch and learn what is going on, so I felt that it definitely assisted my learning process.

Fourth, the VMLs—and the degree to which they were creative or silly—made the difficult course content more palatable:

> I think that Dr. Hewitt's creativity, you know, it really helped, because some of the assignments, I personally found professionally challenging. But the way she is so

> vivacious and creative, she sort of took the sting out or minimized the amount of work, because there was a ton of work involved, but you know, her light-heartedness made it a lot more palatable. (Interviewee 2, ELC 700)

Nonetheless, Interviewee 2 felt that his motivation to learn was strong, regardless of the VMLs:

> I am genuinely conscientious about my work. Period . . . My motivation would have been just to become a better scholar practitioner and better in my vocation—that would have been my main motivation for doing better in the class . . . so whether it'd be a mini lesson or not . . . I am constantly looking at how I can be a better reflective practitioner and scholar practitioner.

This suggests that self-regulated learners may be motivated regardless of the use of flipped instruction, and it raises the question about the degree to which flipped instruction can motivate students who are not already strong self-regulated learners.

5.2.5 Making online courses palatable

For both of the ELC 700 interviewees, the use of flipped video content made their online course experience palatable. For Interviewee 2, his discomfort with technology would have been a barrier to his completion of the course, had it not been for the VML tutorials on technology tools. When asked about how the course would be different without the VMLs, he responded: "I probably would have had to take the class face to face . . . I can't imagine taking it without the VMLs." When asked to clarify, he explained that in VMLs about the various technology used in the program—like Google Hangout—"it was helpful having her show step by step what you needed to do and what the screen should look like."

The instructor saw providing this type of support as part of her role:

> Some folks got into our mostly online program knowing nearly squat about technology, and quite honestly some were almost fearful about it, right? So to kind of move them to be able to use Collaborate and Blackboard discussion and all the stuff you have to use for an online course, since the ELC 700 was the first course in the program, I was the one who had to help them learn all that, and so making these little video mini lessons as I call them, that, you know was critical. One was on "this is Google Hangout," and the next one was "here is how you start a Google Hangout," . . . and I expect them to get this, "you gotta learn this so we can have class together"—it was a way to do what I needed to do, and to give them the support they needed to do on their own without me physically being there.

For Interviewee 5, it was not the technology-related VMLs that were indispensible but rather that flipped instruction provided a pedagogical approach beyond the banal use of discussion board as in her previous online course experience:

> I used to have an online class and it was solely a discussion board, and I kind of dreaded taking the [ELC 700] class because my mind envisioned how it was when I took a course about ten years ago, and so when I saw it was not solely discussion

board but it also has mini videos, you also have the readings, and you get the Google Hangout and all different resources, you know to me it was fabulous.

Thus the flipped model might be part of a larger pedagogical approach to more effective and engaging online learning.

5.4 Limitations of flipped instruction

Limitations of flipped instruction identified by respondents include technology challenges, learner responsibility, challenges for the instructor, not being able to ask just-in-time questions, videos that lack refinement, and the time-consuming nature of video viewing. An obvious limitation for the use of flipped video content is reliance on technology:

> I know I had computer technical difficulty trying to get on from home, for some reason. I think there was software I needed on my computer, and I had to download something and for some reason I was just having troubles. (Interviewee 6)

Additionally, the instructor pointed out that some students work in school districts which block Youtube, a host site for a number of her VMLs, making it impossible for those students to access VMLs while at their work.

Interviewee 3 noted the second biggest limitation to flipped instruction is the "learner responsibility":

> This also puts a lot more of the responsibility of learning on the learner, which I think is important because it's not a sit and get type tool. You are not the one that's just sitting there and getting it. The teacher is not up there—the sage on the stage mentality is wiped out with this . . . The learner can stop and pause and move on and that is great, but the learner's got to have the desire and the motivation to do it. So I think the benefit is . . . being flexible and being very much learner motivated, but at the same time if you have an unmotivated leaner, who puts it off for the last minute, procrastinates, it's not going to be an effective tool.

This suggests that success with flipped instruction requires a certain level of SRL. Additionally, when students do not complete the VMLs prior to class, as expected, it can disrupt instruction. While the instructor believes most students watched the VMLs as assigned, she admitted that compensating for student failure to view was time-consuming:

> I was counting on them to [view VMLs], and if they didn't, then that seemed to show up in the [formative] assessment results at the beginning of class. And in the Stats/Quant class I would say it was one person primarily . . . but when that happened then I felt like I was doing a lot of re-teaching in the classroom.

In a face-to-face setting, an instructor explaining content can observe students' nonverbal signals—head nodding, furrowed brows, confused looks—to get a sense of whether the instructor is comprehensible. The instructor spoke about the difficulty of not getting students' immediate reactions to content delivery:

> I don't have that feedback, like blank looks, people's body language, you don't have these nonverbals letting you know if you are making sense . . . unless I hear back from them, which usually doesn't happen until the next class session, so I think that

> it's hard when you are not getting those nonverbal cues about how clear your content delivery is.

Similarly for students, in a face-to-face setting they are able to ask questions during content delivery when they do not understand. A major limitation to flipped instruction—and the most frequently cited limitation by students—is difficulty getting just-in-time help, although one student pointed out, "well, I don't know. It might be a limitation, but it can be with readings also, when you have a question, and you can't answer it <laughing>."

Interviewee 4 pointed out that "some of the videos looked homemade" and noted issues with the quality of some VMLs (e.g., instructor's handwriting being difficult to read, the end of a VML cutting off). Another student pointed out that while an article or text could be skimmed, viewing a video could be "more time consuming than just reading an article." Interviewee 1 (Stats), who considered trying to flip her undergraduate course, pointed out the difficulty and time investment for the instructor to create a library of VMLs:

> I think that from an instructor standpoint the limitation is that it's very tough to actually do this, the amount of work to do it for the whole course would be tremendous. And there is that you're not always sure if the students are really using them and watching them.

While some of these limitations can be overcome, they remain a challenge to flipping.

6 Discussion

6.1 SRL: Both required for and cultivated through flipped instruction

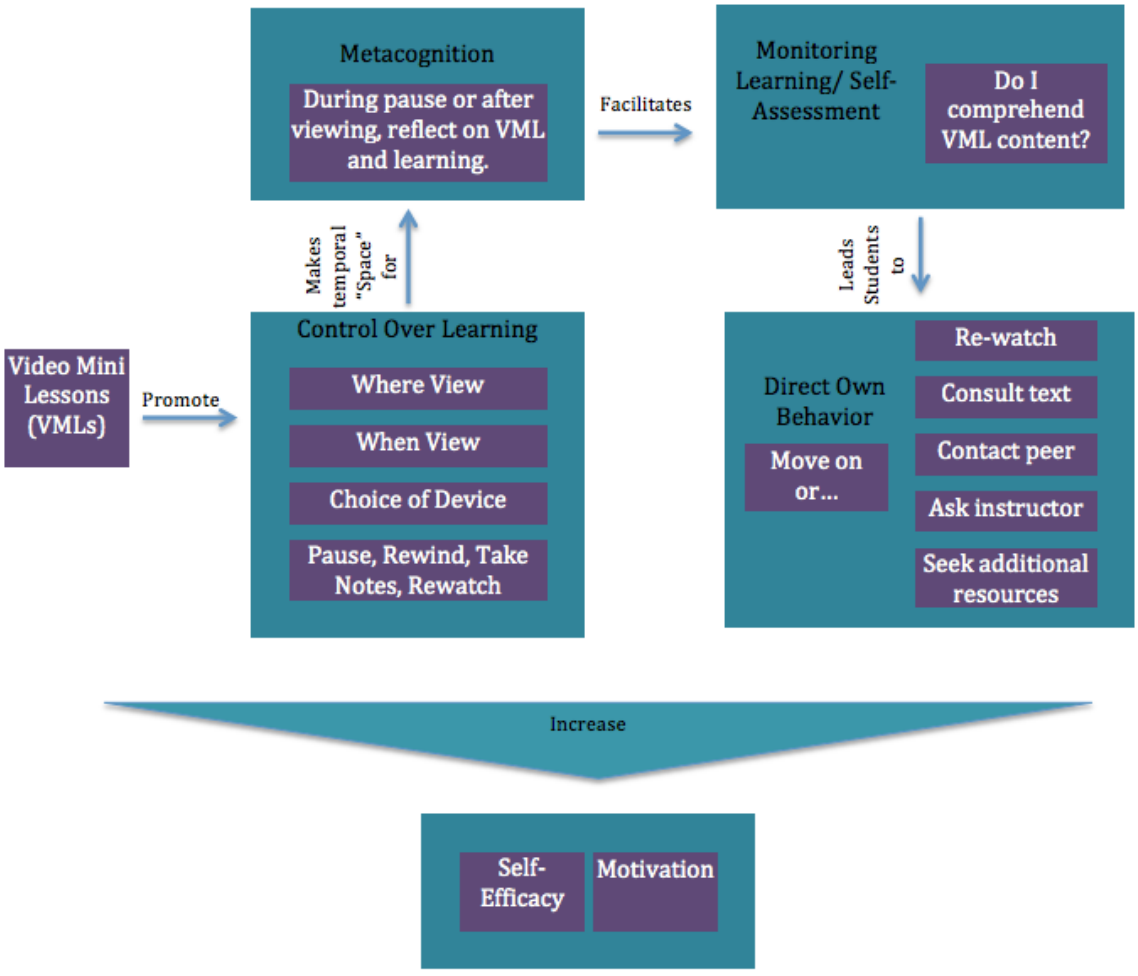
Though flipped instruction is being used in K-12, post-secondary, and graduate school settings, as Interviewee 3 pointed out, flipped instruction requires high learner responsibility to complete required flipped assignments prior to class. Completing flipped assignments requires "*academic delay of gratification*" and "*homework self-regulation*, which refers to setting goals, using study strategies, and self-monitoring to complete tasks outside the classroom" (DiBenedetto and Bembenutty, 2013, p.129). Flipped instruction, it seems, requires of students a certain degree of SRL in order to be successful. This study involved two advanced graduate courses. By virtue of the fact that students in these courses have successfully completed undergraduate and Masters programs, it can be safely assumed that they exhibit a fairly high degree of SRL.

Regardless, what is clear from this study is that students value the *control over learning* that they perceive the flexibility of flipped instruction provides, a finding that reinforces the work of Cole and Kritzer (2009). Additionally, control over learning is a condition for SRL (Bergamin, Werlen, Sigenthaler, and Ziska, 2012); as such, to the degree that flipped instruction provides this control, it promotes SRL. Also clear from the study is that students perceived that flipped instruction promoted student motivation, which is itself a key component of SRL (Zimmerman, 1990). Additionally, students reported feeling more confident because of the flipped video content. This confidence may translate into stronger self-efficacy, which is a key component of motivation and "perhaps the most important factor in . . . guaranteeing quality outcomes" (Nodoushan, 2012, p.6). Also, flipped instruction frees up class/synchronous online time for student-

centred activities supported by the instructor. McDaniel and Caverly (2010) argue "spending a greater proportion of the class time interacting with students is one of the most important aspects in student motivation" (p.40). In this respect, flipped instruction may doubly motivate students, both through the flipped video content itself and also by making time for increased instructor interactions with students during class/synchronous online time.

One of the most powerful findings of this study is that flipped video content provides the temporal space for students to reflect on and self-assess their learning; in other words, flipped instruction provides an environment conducive to metacognition, a main element of SRL (Zimmerman, 1990). Indeed, Strayer (2012) concluded that "students in an inverted classroom become more aware of their own learning process than students in more traditional settings" (p.191-192). Figure 2 provides a conceptual framework for how flipped instruction using video content appears to support SRL.

Figure 2. How flipped instruction cultivates self-regulated learning.



In Figure 2, the VMLs promote *control over learning* by providing students with flexibility regarding where and when to view content, on what device to view content, and when to pause, rewind, take notes, and rewatch. This control over learning creates the temporal "space" for *metacognition*. During pauses in viewing or after completing a VML, students can reflect on their learning and monitor/self-assess by asking, "Do I comprehend VML content?" This metacognition leads students to *direct their own behaviour* by moving on, rewatching the VML, consulting course texts, contacting peers or the instructor, or accessing additional resources. These processes can result in increased student *self-efficacy* and *motivation*.

Ironically, flipped instruction appears to both cultivate SRL and require it. Flipping instruction might help a student increase or mature her SLR, but students who are successful in this model may have to have a requisite amount of or maturity with SRL in order to be successful with the method. Is this requisite amount greater than that required of students in traditional courses? Do other approaches to flipped instruction (beyond the use of video content) similarly require and cultivate SRL? What can instructors do to ensure that students have the requisite SRL in order to be successful with flipped instruction? These important questions remain unanswered and can inform future research.

6.2 Recommendations for research on flipped instruction

Flipped instruction is a burgeoning pedagogical approach that deserves additional research attention. Researchers might develop a typology of video content that can be used to inform pedagogical choices. Future research may further examine how flipped instruction looks different from class to class based on student population, course content, the instructor's philosophical commitments, etc. Indeed, the Technological Pedagogical Content Knowledge framework developed by Mishra and Koehler (2006) may serve as a conceptual framework for this research, which might lead to the articulation of multiple models of flipped instruction. Additional research may examine, specifically, what level of SRL is required for success with flipped instruction. Finally, the conceptual framework presented here in Figure 2 of how flipped instruction promotes SRL may be "extended to other cases or refined in light of them" (Eisenhart, 2009, p.59).

7 Conclusions

This study illustrates that there is no single model for the flipped classroom. It is clear that flipped instruction both requires self-regulated learning and cultivates it, as conceptualized in Figure 2. Flipped instruction creates the temporal "space" for metacognition and can increase self-efficacy and motivation. This study further evidences the usefulness of flipped instruction for initial learning, troubleshooting, review, application, and even extensions beyond the classroom. Additionally, flipping can make online learning more palatable. Flipped instruction can be a powerful pedagogical tool and warrants additional research.

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Appendix A
Student Interview Protocol

1. Tell me about the video mini lessons (VMLs) used in your [statistics and quantitative methods OR ELC 700 course with Dr. X]. Possible probing questions:
    a. What were they for?
    b. How helpful were they?
2. This next set of questions is about your VML viewing habits:
    a. Would you say that you watched all of the VMLs, most, half, or less than half of them?
    b. Did you watch any VMLs multiple times? If so, about how many (1, several, many)? Can you remember the topics of any of the ones that you watched multiple times? Why did you watch some VMLs multiple times?
    c. Where did you watch VMLs (home, office, on the go, etc.)?
    d. On what kind of device did you watch them (e.g., laptop or desktop computer, tablet, smartphone)?
    e. When you watched them, did you watch them straight through? Pause? Rewind/go back? Take notes, etc.?
    f. When you watched VMLs, did you watch them and move on, or did you watch them and reflect on whether they made sense? Did you note questions you had? Did you consider how well you understood the content?
    g. As a function of watching the VMLs, did you seek out additional resources (e.g., when you didn't understand something)?
3. To what extent were the VMLs an important part of monitoring and evaluating your learning?
4. How--if at all--did the VMLs influence your motivation to learn in this course?
5. What did you use the VMLs for? Initial learning? Revisiting content to clear up confusion or refresh learning? When you needed to produce an assignment?
6. To what extent was watching the VMLs an effective use of your learning time?
7. What are the main benefits of the VMLs?
8. What are the limitations or weaknesses of the VMLs?
9. How could the VMLs have been used more effectively in the course?
10. How would this course have been different without the use of VMLs?
11. What advice do you have for Dr. X and for other professors who are considering using VMLs in their courses?
12. What advice do you have for other graduate students about how to approach and use VMLs?

Appendix B
Instructor Interview Questions (based on TPCK framework)

Background Questions
--How long have you been teaching these courses?
--Is this your first time teaching them online/flipped?
--Did you teach them F2F before teaching them online/flipped? If so, which way do you prefer? Why?

Technological Questions
--How would you describe your technological expertise, especially how it relates to teaching flipped courses?
--What is your background in technology? How did you learn your technological expertise?
--What do you see as particularly effective uses of technology in a flipped classroom? Why?
--What challenges, from a technological standpoint, did you face in teaching a flipped course?
--How did you make the decisions to use various aspects of technology in your flipped courses?
--In what ways do you think your use of technology complements your teaching philosophy?
--In what ways do you think your use of technology complements your content instruction?
--How well were your students able to navigate your use of technology in the flipped courses? What challenges did they have?

Pedagogical Questions
--What is your teaching philosophy?
--Why did you decide to teach this course in a flipped manner?
--How does teaching the course in a flipped manner fit within your teaching philosophy?
--How do you believe the flipped instruction affected your students' learning?
--In the future, would you continue to teach this course in a flipped format? If so, why? If not, why not?
--How did you have to change your instruction in order to teach this course in a flipped format?
--What were the biggest challenges, from a pedagogical standpoint, did you face in teaching the flipped courses?

Content Questions
--How would you describe your depth of content knowledge in XXX

--What are the common challenges in teaching XXX to graduate students?
--How do you think the flipped instruction helped alleviate or contributed to these challenges?
--How did your knowledge of the content area influence your use of technology in the flipped class?
--What were the biggest challenges, from a content standpoint, in teaching this course in a flipped format?