

“Just tell me what I need to know to pass the exam!” Can active flipped learning overcome passivity?

Diane Kenwright, Wei Dai, Emma Osborne, Tehmina Gladman, Peter Gallagher & Rebecca Grainger

University of Otago Wellington, New Zealand

Abstract

Although the flipped classroom approach has been theorised to encourage active learning, recorded lectures were used as flipped learning activities in the majority of the flipped learning studies, which many still consider to be passive knowledge input. To further promote active learning, the first four modules in a pathology course at University of Otago Wellington were flipped and delivered to fourth year medical students with redesigned active learning activities based on constructive theory of learning. The innovative active learning tasks were delivered via “kuraCloud” (an online-learning platform) and included short video clips, labeling exercises, written questions with immediate feedback, multiple-choice questions with explanatory text and links provided for further information. Students were required to complete all the activities prior to a face-to-face tutorial. A mixed methods design was used in which student engagement was assessed using both survey instruments and focus groups. Results showed that students did not engage with the new flipped learning activities designed to improve active learning, they preferred the passive learning approach with exam- or clinical practice- based core knowledge summarized and delivered to them directly. Three themes emerged: 1. Students considered the time invested in the active learning activities was inefficient. 2. The flipped course challenged students’ sense of predictability. 3. The knowledge construction process was valued as application rather than learning. This might be attributed to time-poor medical students judging the value of the learning task based on the relevance to their immediate learning goal: pass the exam, the new flipped learning activities imposing a heavy cognitive load that impairs the knowledge construction process and the less predictable structure of the flipped learning environment compared to the familiar traditional lectures.

Keywords: *Passive Learning; Active Learning; the Flipped Classroom; Course Structure; Cognitive Load*

Practice Highlights

- Students prefer passive learning to active learning.
- Medical students judge what to learn and when to learn based on the perceived value of the task to their learning goals.
- Students prefer structured learning to fragmented flipped learning.
- Constructing knowledge is regarded as application rather than learning.
- Overloaded working memory impedes flipped learning.

I. INTRODUCTION

Passive learning has been theorized to facilitate surface learning or rote learning, rather than deep learning (Ramsden, 1997). When students are “passive learners” they receive information without actively seeking connections between their old knowledge and

the new knowledge, leading to poor cognitive engagement in the learning process (Allosopp et al., 2007). Learning has been theorized to be a process of schema (meaningful combination of elements) construction, which can be achieved by bringing elements together during problem solving, integration

of new elements into existing schemas, or by acquiring information that has already been schematized (Sweller et al., 1998). The constructivist theory of learning suggests that the most effective learning occurs when knowledge is constructed or reconstructed by individual learners rather than being transmitted directly from instructors (Piaget, 1967; Phillips, 1995). Student engagement may be best achieved during the knowledge construction process, in which students are actively integrating new information into the old information.

Rooted in constructivist theory of learning, the flipped classroom approach has been theorized to be effective in enhancing student engagement by actively involving students in their own knowledge construction processes (Hannafin et al., 1997; Kim et al., 2014; Gilboy et al., 2015; McLaughlin et al., 2013; James et al., 2014). Specifically, the flipped classroom is an innovative pedagogical approach where the instruction happens outside the classroom, while interactive learning activities that encourage higher-order thinking and knowledge application take place inside the classroom (Lage & Treglia, 2000; Strayer, 2012; Bishop & Verleger, 2013). Compared to traditional lectures where knowledge is passively delivered to students, the flipped classroom is composed of active and constructive learning tasks that may promote student engagement in health professional education.

The conventional flipped classroom typically delivers content by videos of lectures uploaded online, which could still be considered passive knowledge input. By replacing the traditional instruction in flipped classrooms with innovative learning activities based on the constructivist theory, students may be actively involved in the information-seeking process during problem solving, which is the key element in active learning (Allen & Tanner, 2005).

In this research a flipped classroom approach using online learning activities with a design based on constructivist theory was used. We hypothesized that active pre-learning activities would enhance the information integration process and improve student engagement.

II. METHODOLOGY

A. Participants

Seventy-five fourth year medical students (mean age 22.7 ± 2.2 years) enrolled in MBChB at University of Otago Wellington, New Zealand, participated this study. Forty-six were female (61%) and 29 were male (39%). Forty-nine were New Zealand European (65%) and 20 were Asian (Chinese and Indian descent) (26%).

B. Design

In 2015 the anatomic pathology teaching at the University of Otago Wellington employed two different delivery styles for the eight modules. The first four modules were delivered with a flipped format: cardiovascular (CVS), central nervous system (CNS), respiratory (R) and gastrointestinal (G). Students first completed activities in an e-learning platform “kuraCloud” <www.kuraCloud.com> were completed by students with knowledge delivery accompanied by multiple-choice questions, short video clips formatted as mini lectures, labeling exercises, quizzes with instant feedback, and written questions with answers given after student attempt, all designed to promote active knowledge construction. The students then attended face-to-face tutorials that included clinical cases with multiple choice questions, pair/share activities and flip card building. This research was approved by the Human Ethics Committee of University of Otago.

C. Evaluation and Assessment

1) Data Collection: This mixed methods study design used paper-based surveys and a focus group. A pre-course survey was administered to students prior to the flipped modules recording demographic information and perceived value of the course. A post-course survey assessing perceived value of the course, intrinsic motivation and time and study environment was administered in class time to students after the four flipped modules were completed, using a selected part of the Motivated Strategies of Learning Questionnaire (MSLQ; Duncan & McKeachie, 2005). All items were completed by students using a seven-point Likert scale (1=strongly disagree, 4=Neutral and 7= strongly agree), and a high value of reliability is observed (Cronbach’s $\alpha = 0.902$). The post-course survey also requested students provide open-ended responses regarding their usage and reflections of online-learning using kuraCloud, including if learning activities were completed before or after tutorials, how often a video clip was watched thoroughly and whether the correct answer of a question was checked before or after they attempted the question.

Focus group questions were developed based on thematic analysis of open-ended questions in the post-course survey of the fourth-year pathology course (Figure 1). Students were invited to participate in the interviews when completing the end of course evaluation and again by the verbal invitation at the end of a lecture. Six fourth-year students volunteered to participate the focus group, which lasted an hour and was audio-recorded.

2) Data Analysis: Quantitative data analysis was conducted in SPSS 22. Since survey data were ordinal variables, nonparametric tests were used for analysis. The Wilcoxon signed rank test was used to compare responses of perceived value of the course in pre- and post-course survey.

The focus group interview was facilitated by two research assistants. Focus group data were analysed using thematic content analysis, with data transcribed and analyzed thematically by reading and re-reading the transcripts, coding themes emerging from the transcripts together with possible connections between themes (Braun & Clarke, 2006; Burnard et al., 2008).

Some focus group questions:

1. How did you study for pathology during the week?
2. What gets squeezed out when there is time pressure?
3. Students learn most effectively when they discover and construct their own knowledge. In the pathology course, how have you learnt most effectively?
4. In kuraCloud we try to allow you to construct knowledge by providing a clinical context, allowing knowledge discovering a guided way then testing it to reinforce the learning. How would you improve this process?
5. Having thought about the way we are trying to help you learn, have you changed your opinion on the course?

Figure 1. Some questions used in the focus group

III. RESULTS

A. Survey

The post-flip course survey showed medium intrinsic motivation in studying with challenging active flipped learning materials for majority of students ($M = 4.73$, $SD = 1.05$). Moreover, students' perceived task value declined compared to the pre-course survey, with less intention to learn more pathology (pre-course median = 6.0, post-course median = 5.0, $p = 0.002$). Finally, students did not prioritize their study time for this flipped course ($M = 4.16$, $SD = 0.62$), with 55.3% of the students saying they did not spend very much time on this course due to their commitment to other academic activities, which they valued more highly.

B. Focus groups

Three major themes were identified regarding the students' perception on the active flipped learning approach (starting from the most significant theme):

Theme 1: Time invested in the active learning activities was inefficient.

Students regarded the active learning process as extremely time-consuming and inefficient. One student reported: *"On constructing your own knowledge – I think that's a great idea but we're very time-restricted so we don't have time to sift through that."* Consistent comments were made by another student: *"As a medical student I feel like I'm pressed for time – if there's something simple...it makes it so much easier. If ...we can access that information much quicker and retain it, which will make exam time easier and make us better clinicians ..."*

Structured information delivered passively was considered to be the most efficient approach to learning: *"I think lectures are an easy way to give information quickly. They're not very tailored, you just run through them quickly. My ideal pathology course*

would be a lecture that summarizes all the main diseases we should know, gives us a quick overview, summarizes things and points us to where we need to go..."

Theme 2: The flipped course challenged students' sense of predictability.

Students reported that they perceived the flipped learning as unstructured and this created uncertainty, which made it hard for them to identify the link between the task and the learning goals. One student said *"In everything else half of the time they even tell you what you're meant to be learning. So you walk away going 'I hope I saw everything I was supposed to'."* Another student said: *"There were different links and it doesn't seem as organised as it could be."*

Theme 3: The knowledge construction process was valued as application rather than learning.

Students conceptualized learning and applying knowledge as two non-overlapping activities. They described learning as acquiring new factual knowledge, which they distinguished from the task of applying this knowledge either in flipped classroom activities or quizzes. One student reported: *"Last year...we were given a powerpoint before our pathology tutorials- that was the construction of knowledge, then we went into tutorials and had a quick quiz, then we applied the knowledge."* Similarly, another student commented: *"The most helpful thing is to apply knowledge – to be quizzed and to be able to answer, so kuraCloud is good because it has instant feedback. I can type my answer out and compare it to hopefully a good answer and go, I've got these points but I missed these points. To me, that's constructing my knowledge and making me recall it and that's very useful to me."*

IV. DISCUSSION

Medical students engaged poorly with the flipped learning process used in this undergraduate anatomic pathology course. They preferred the traditional passive teaching method of a lecture providing summarized knowledge over active learning requiring searching for information and building meaningful connections, which they perceived as time-consuming and unstructured. This can be explained by the expectancy-value theory of motivation, which assumes that behavior is a function of the individual expectations and the perceived value of the goal that is being pursued, and the behavior people will choose is one that can achieve the most expected success and value (Fishbein & Ajzen, 1972). In the educational context, students' engagement is closely related to their understanding of the value of the learning activities towards examinations. For improved engagement in any learning activity, a connection must be built between the learning activities and passing the course (Karaksha et al., 2013; Biggs, 2003). The medical curriculum is crowded and students judged the new active flipped activities a poor investment of their time, despite a sound underlying pedagogical basis. With other academic disciplines taught concurrently, medical students failed to properly engage in the active learning process because the amount of time required to complete the active flipped learning process did not contribute to their immediate learning goal, which was to pass the exam. Since traditional assessment still emphasizes the mastery of independent pieces of knowledge rather than the ability of integrating knowledge, it is very difficult for students to recognize how these innovative learning activities aimed at higher level of Bloom's taxonomy (Bloom, 1956) can improve their academic performance (Biggs, 2003). Therefore, passive learning, such as traditional lecture format with important knowledge relevant to the exam and clinical practice summarized and directly delivered to students, is still regarded as the most efficient and preferred way of learning.

Another reason why students perceived flipped learning as inefficient may be the heavy cognitive load imposed by flipped learning tasks on kuraCloud. Cognitive load theory assumes that human cognitive architecture consists of a capacity-limited working memory and unlimited long-term memory (Merriënboer & Sweller, 2010). The knowledge construction process can be affected by the working memory resources available for processing new information. To successfully complete the redesigned flipped learning activities in the present study, students needed to synthesize information from multiple sources, including previous knowledge, information provided as hints in kuraCloud and websites out of

kuraCloud using the link provided. Students' working memory might have been overloaded when trying to seek, process and integrate relevant knowledge simultaneously, which may hinder the knowledge construction process and lead to a poor learning experience (Sweller, Merriënboer & Paas, 1998; Merriënboer & Sweller, 2010). Future research should focus on reducing unnecessary cognitive load of online flipped activities in order to facilitate effective learning process, while still maintaining active learning.

Compared to the more structured and task-orientated environment provided by the traditional lectures, the fragmented nature of the flipped classroom might be another possible reason why students prefer traditional passive learning. Specifically, traditional lectures provide a predictable structure to students that allows them to see connections in the knowledge delivered in a familiar way (Strayer, 2012). Whereas in the less-structured flipped learning environment, the orientation varied across flipped learning activities, so that students experienced a high level of unpredictability and uncertainty (Strayer, 2012). This is supported by the qualitative data in the present study, with students less satisfied with the flipped classroom approach in terms of course structure, which made them feel that course objectives were not clear enough and it was hard to see connections among concepts learnt in a meaningful way.

V. IMPLEMENTATIONS AND CONCLUSIONS

Although the flipped classroom has been found to improve students' motivation and engagement, this study showed there remain challenges related to this transformative process. Students are more comfortable with the traditional passive learning where knowledge has been provided directly to them, that does not demand higher-order thinking. Using an active learning approach that is different from students' expectations might lead to frustration. To alleviate frustration and convert students from passive learners to active learners, the following points might be considered when implementing the flipped classroom approach:

1. Consideration should be given to students' workload when designing flipped learning activities (Al-Zahrani, 2015). Medical students are very likely to have crowded curriculum, therefore, it is important not to increase the extra workload. Based on our experience, flipped learning activities that can be completed within half an hour would be appropriate as pre-contact class preparation.
2. The instruction and learning activities should be designed following principles of cognitive load

theory. The pre-contact lesson materials should be from a single-source and easily accessible to reduce external cognitive load so that more working memory resources will be available for meaningful and effective learning process (Merriënboer & Sweller, 2010).

3. Learning goals should be precisely summarised for students before flipped learning activities. When students have a clear view about what they are expected to learn and how these learning goals connected to the flipped learning activities, they are more likely to be motivated to engage in the active learning approach (Hidi & Renninger, 2004).
4. Students' perception of learning and application should be changed prior to implementing the flipped classroom approach. Students are used to the traditional passive learning model where knowledge input comes before knowledge application. It is important to introduce the concept of "learning by doing" (Dewey, 1929; Reigeluth, 1999) to students to reduce the distinction between learning and application before the implementation of the flipped classroom approach.

In conclusion, students failed to embrace the redesigned flipped learning approach and responded with frustration and discomfort, which prevent them from cognitively and emotionally engaging in the active learning process. Passive learning with the main points summarized and presented before application is still regarded as the most efficient way of learning by these time-limited medical students. To facilitate an active learning process, instructors should design the flipped learning activities carefully with consideration given to students' workload, the cognitive load imposed by outsourced information, the clarity of expected learning goals and the change of students' conception of learning.

Notes on Contributors

Dr. Diane Kenwright is the Head of Department of Pathology and Molecular Medicine, University of Otago, Wellington. She investigates student engagement with elearning.

Wei Dai is a research assistant of Department of Pathology and Molecular Medicine, University of Otago, Wellington. She is currently doing her Ph.D. in Educational Psychology in Victoria University of Wellington. Her research interest lies in the area of involvement of cognitive resources in the learning process.

Emma Osborne is the Student Learning Advisor of at

the University of Otago Wellington. She has a Masters of Education in adult education, with a focus on how people learn in the context of community development projects. Emma is interested in active learning and embedding transferable academic skills into students' coursework.

Dr. Tehmina Gladman is a member of e-learning team at the University of Otago Wellington. She has tertiary level instructional experience, and instructional design and eLearning training and development experience. Tehmina sees her position as one of facilitating the development of faculty expertise in the use of eLearning tools.

Dr. Peter Gallagher is the medical education advisor at the University of Otago Wellington.

Dr. Rebecca Grainger is a consultant rheumatologist. She teaches chemical pathology and is the course convenor for the undergraduate pathology teaching programme at University of Otago Wellington.

Ethical Approval

Standard institutional review board (IRB) procedures have been followed and approval obtained by the authors.

Acknowledgements

The authors would like to thank Professor Brett Delahunt for reading and commenting on the paper and all the students in year 4 of University of Otago Wellington MBChB 2015 who participated the research.

Declaration of Interest

Authors have no conflicts of interest, including no financial, consultant, institutional and other relationships that might lead to bias.

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*Wei Dai
23a Mein Street
Newtown, Wellington
Tel: +64 385 5515