



'Flipping or Flapping?' Investigating Engineering students' experience in flipped classrooms

Journal:	<i>On The Horizon</i>
Manuscript ID	OTH-04-2017-0014
Manuscript Type:	Case Study
Keywords:	Flipped classroom, Technology Enhanced Learning, Blended Learning
DOI (10.1108/OTH-04-2017-0014)	

SCHOLARONE™
Manuscripts

Horizon

‘Flipping or Flapping?’ Investigating Engineering students’ experience in flipped classrooms

Purpose: This study has explored the flipped classroom model in a private university in Malaysia. It presents a flipped classroom intervention for engineering education innovation.

Design / Approach: The research (1) revisited prominent educational theories for a flipping or flapping pedagogy, (2) implemented and explored the flipped classroom experiences in one engineering subject; using the action inquiry method with thematic analysis and (3) reflectively evaluated both students’ and educators’ ‘flipping or flapping experience’.

Findings: The responses of the research participants are analysed and used to develop the Flipping or Flapping Classroom Principles and an Ideal Flipped Classroom Model. From passive lectures to active learning with collaborative discourse and reflective communication, flipping the classroom can offer a seamless learning experience.

Research Limitations / Implications: The Flipped Classroom Model can provide good reference for other educational researchers who intended to conduct flipped classroom. However, the small sample size with qualitative method and thematic analysis employed led to considerable theoretical development, but it may not achieve the validity standards to generalise the findings. Further empirical investigation with systematic controlled group is recommended for future work across disciplines for extrapolation.

Keywords: Flipped classroom, Technology Enhanced Learning, Blended Learning

Introduction and Background

The term ‘flipped classroom’ or ‘flipped-mode teaching’ has gained considerable currency in the past few years to depict innovative forms of flipping the traditional education model, by providing more interactive and engaging face-to-face learning activities. Students are required to study pre-class learning materials (with the aid of educational technologies) before attending the flipped classroom, where conventional

1
2
3
4 in-class lectures are replaced with collaborative activities, application discussion or
5
6 hands-on projects (Tucker, 2012; Chen, Wang, Kinshuk, & Chen, 2014).
7

8
9 The development of the flipped classroom is increasingly being discussed and
10 explored in higher educational institutions across disciplines and continents in the past
11 few years (Herreid, & Schiller, 2013; Kengwee, Onchwari, & Oigara, 2014; Khan
12 Academy, 2015; McCrea, 2016). Educational researchers and practitioners have
13 investigated and debated the rationale and both the positive and negative experiences of
14 flipping the classroom. Schools that support this emerging 'flipped' model stress that it
15 promotes active learning and enhances student engagement (Hussey, Fleck &
16 Richmond, 2014; Gilboy, Heinerichs, & Pazzaglia, 2015). In addition, a flipped
17 classroom offers greater opportunity for in-depth peer discussion in classes and problem
18 solving among students (Youngkin, 2014). Thus, this further interaction facilitates
19 substantial development in critical thinking skills and cognitive development in the
20 subject matter (Kong, 2014). Students prepare prior to the actual class, i.e., watch pre-
21 recorded videos and take online quizzes; taking more responsibility for their own
22 learning (Gecer & Dag, 2012). Flumerfelt and Green, (2013) assert that a flipped
23 classroom has an impact on learning across all academic levels and ages, whereas Boyer
24 (2013) claims that a flipped model is a 'pedagogical shift in the use of class time'
25 (pp.29).
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45

46 Conversely, the flipped model could be viewed as a 'flapping' experience
47 without moving forward nor improvements experienced in learning while too much
48 effort is being put in. Some academics complain that there is a substantial amount of
49 additional workload on educators such as pre-recording video lectures, designing
50 flipped classroom activities and approaches to motivate students for the 'extra'
51
52
53
54
55
56
57
58
59
60

1
2
3
4 preparatory work to engage in the flipped classroom (Acedo, 2013). From students'
5 perspectives, the time spent on the self- and pre-studying can be overwhelming. For
6 instance, in a traditional classroom setting, students need to attend 4 hours of lectures
7 and tutorials. With the flipped classroom model, students are required to conduct 2-3
8 hours of self-studying prior to classes in preparation for pre-class quizzes, plus 3-4
9 hours of in-class activities for in-depth discussions and collaborative activities. The
10 expectations of how far the blend of technologies and IT infrastructure supports the
11 flipped classroom in meeting students' expectation are yet to be explored (Hiew and
12 Chew, 2016). Hence, this paper aims to discuss the 'flipping or flapping' experience
13 from students' perspective. It summarises an action research with reflective discussion
14 of the 'flipping or flapping' classroom principles.
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29

30 **Research Method and Theoretical Ground**

31
32 The action inquiry method is a research approach that conducts action and inquiry
33 concurrently as a disciplined leadership practice that may increase the effectiveness of
34 the proposed actions (Torbert, 2001). There are 4 phases in the action inquiry method
35 (Meyer, 2003): (a) Visioning; (b) Strategizing; (c) Performing; and (d) Assessing which
36 are adapted as follows:
37
38
39
40
41
42
43
44

45 A. Visioning

46
47
48 In this paper, we explore the motivations and educational theories that underpin the
49 flipped classroom practice; what possible pedagogical challenges and approaches need
50 to be worked around? The consequences of not being able to flip the classroom
51 seamlessly would be the 'flapping' circumstances, which lead to a disruptive learning
52
53
54
55
56
57
58
59
60

1
2
3
4 and teaching experiences compared to an ideal ‘flipped’ classroom. This paper attempts
5
6 to respond to these questions by (1) revisiting prominent educational theories for a
7
8 flipping or flapping pedagogy, (2) exploring the flipped classroom in one Engineering
9
10 subject and (3) reflectively evaluating both students’ and educators’ ‘flipping or
11
12 flapping’ experience.
13
14
15
16

17 B. Strategizing

18
19 We briefly review the educational theories underpinning flipped practices. Locke began
20
21 with the *tabula rasa* concept: (1) students are in a blank state, and the educator is
22
23 similar to parents who instil knowledge into the students’ blank state, and (2) students
24
25 are submissive and subservient, receiving knowledge passively from the educator who
26
27 has more authority (Locke, 1995; Huyler, 1997). However, Freire ‘flipped’ the
28
29 traditional ‘oppressed pedagogy’ through the elimination of the authoritative
30
31 instructions and knowledge instilling from the educator; instead, educators are to create
32
33 an autonomous and constructive learning environment for students to learn from active
34
35 reasoning and collaborative discourse (Freire, 1970; Johnston, 1996; Glass, 2001).
36
37 Dewey extends the educational paradigm to emphasize ‘learn by doing’; the educator
38
39 creates a praxis environment. Reflections are introduced, which requires constructive
40
41 dialogue, reflective learning activities and communication with more opportunities for
42
43 self-learning (Dewey, 1960; Simpson, 2001).
44
45
46
47

48
49 In this paper, we explore the impact of a flipped classroom implementation. Purposive
50
51 sampling is used to glean knowledge from individuals that have particular expertise
52
53 (Bryman, 2012; Daniel, 2011). The selected research participants were staff and
54
55 students who pioneered a flipped classroom learning subject in an Australian University
56
57
58
59
60

campus located in Malaysia. These experiences during the first exploratory phase would highlight potential new areas of interest or disruption, while opening doors to other future educational practitioners for flipped classroom implementation in the University.

C. Performing

A traditional lecture in the University is typically held in a large hall with lecture slides projected on a screen, wherein the lecturer provides a detailed explanation of the topics covered and students work through problem solving exercises in their own time. The flipped classroom instead allows more face-to-face discussion on problem solving because lecture content and quizzes have been converted to pre-class activities as described in Table 1.

Table 1. Typical Sequence in Flipped Classroom Approach

Week No.	Activity	Marks
1	Pre-Class: Watch several short video lectures (10-15 mins each, total duration is 1-1.5 h) uploaded on Moodle/YouTube. Complete a 20-min online quiz consisting, typically True or False and Multiple Choice Questions	~0.5% per Quiz for a total of 8%
2	Flipped Classroom: Students gather in the lecture hall to work through several worksheets in small groups and facilitated by the lecturer based on topics covered in video lectures and online quizzes before the start of this session.	
3	Tutorial: Lecturer or tutor stamp completed worksheets and provide simple verbal feedback on a one-to-one basis. Students are encouraged to practice on additional exercises from the recommended textbook and ask questions during this session.	~0.5% per Worksheet for a total of 8%

D. Assessing

A total of 136 students were surveyed in Semester 1 and 2 using an anonymous online survey (SurveyMonkey, 2014), and a total of 91 students responded (67%). The lecturer, tutors and students were interviewed by a project investigator who does not

1
2
3
4 teach the subject. The online survey and interviews were used to explore the flipped
5
6 classroom perception and assess students' and educators' 'flipping or flapping'
7
8 experiences by observing the provision of online documents, learning materials, and
9
10 assessment methods. All responses were analysed using thematic analysis (Greg, 2012)
11
12 with open coding followed by axial coding approach (Strauss & Corbin, 1998) in which
13
14 the educational theories discussed above represent the responses and explore how and
15
16 why they are related. The data analysed in this research are depicted in Table 2, Figure 6
17
18 and 7 in four dimensions.
19
20
21
22

23 **Results and Discussion**

24 *General Discussion*

25
26 Comparing the results depicted in Figures 1, 2 and 3, this implementation of the flipped
27
28 classroom shows the learning experience shift from the traditional culture of 'listening
29
30 to lectures' and 'copying knowledge from lectures' to actively and repeatedly engaging
31
32 with the online quizzes, worksheets and peers / lecturers at their own pace.
33
34
35
36
37

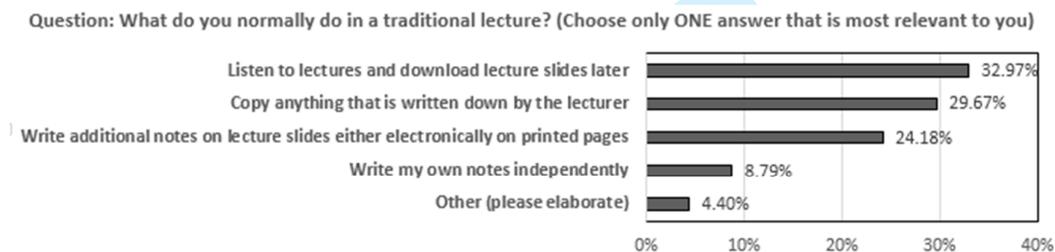


Figure 1. Before Flipped Classroom

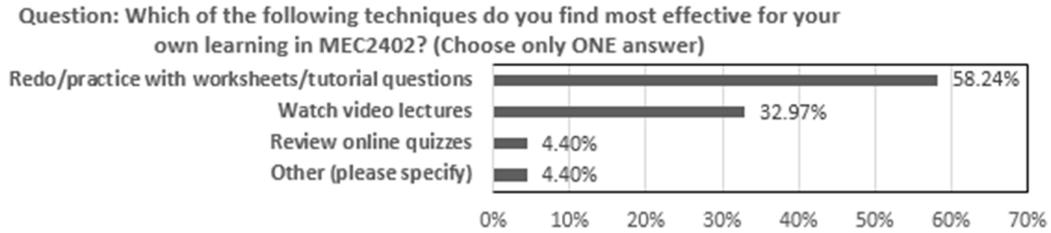


Figure 2. After Flipped Classroom

Before the implementation of the flipped classroom, Figure 1 reflects that students engage with traditional classroom learning in a passive manner: listen to the lecture notes, copy anything that is written by the lecturers and write additional notes on the lecture notes. Of the students, 8.8% would learn independently by writing their own notes. However, after implementation, students tend to engage with the learning actively by practising on worksheets or tutorial questions and watching the video lectures repeatedly at their own pace (refer to Figures 2, 3, Table 2, Tutor-048 comment).

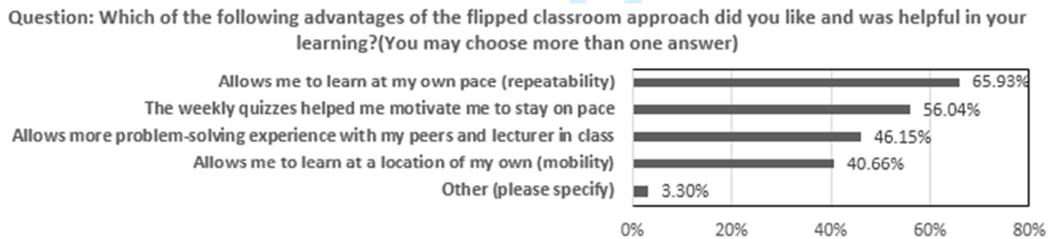


Figure 3. After Flipped Classroom II

Based on the educational theories discussed above, we categorise the participants' responses based on thematic analyses as follows:

Table 2. Summary of Participants' Response

<p>Theme 1:</p> <p>From <i>tabula rasa</i> (theory instilling) to learn by doing and reflective individual</p>

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4 learning activities at their own pace or in a groups (Locke, 1995; Huyler, 1997;
5
6 Glass, 2001; Gecer & Dag, 2012)
7

8
9 **Responses:**

10 “If you compare primary school, the teachers spoon-feed you everything. I mean at this level, you should **take**
11 **the initiative and learn beforehand** and get to study everything first... to **be prepared** before the class,”

12
13 ~Student-086

14
15 “We can learn **at any time we want.**” ~Student-116

16
17 “**The quizzes** are great ways to keep the students in touch with the video lectures- ensure that **you do the**
18 **work**” ~Student-116

19
20 “With the flipped learning, it opened up more time for student involvement and having more face-to-face
21 hours, **doing hands-on learning** in their labs, programming and having more guidance in their CAD skills.”

22
23 ~Lecturer

24
25 “The positive experience about this flipped classroom thing is that it helps me to **get ready** and helps me **keep**
26 **consistent in pace** of what is happening throughout the whole semester” ~Student-058

27
28 “It does train the student to be more **independent**...instead of us having to explain to them you need to do
29 this do that.” ~Tutor-048
30
31

32
33 **Theme 2:**

34 From passive lectures to active learning with collaborative discourse and reflective
35 communication (Simpson, 2001; Ray & Powell, 2014; Youngkin, 2014)
36

37
38 **Responses:**

39
40 “Flipped classroom is like you go into the class, you **understand** the **background** and if there is any **question**
41 **you can ask**...it is better.” ~Student-086

42
43 “With the flipped classroom, you have a better interaction with the lecturer. Students highlight certain things
44 that they are not clear about, then the lecturer can pinpoint it.” ~Student-090

45
46 “I wanted to spend more face-to-face time with my students by demonstrating my thought process in solving
47 engineering-based problem and **getting them to do it with me, rather than making them sit together to**
48 **watch me talk for at least 1 to 2h**...and having a laid-back attitude if they were to go through a traditional
49 lecture in this decade”. ~Lecturer
50
51
52
53

54
55 **Theme 3:**
56
57
58
59
60

Seamless learning in a relaxed and uninterrupted manner (Hiew & Chew 2016)

Responses:

“The traditional way is very time consuming. And if you don’t know then you have to raise your hand and ask, **that’d just stop the lecture**, so it’s not that efficient” ~Student-086

“Flipped classroom does give us more freedom **to do what we can do** to really help on those really **genuine questions, those really complicated ones.**” ~Tutor-048

“In a typical classroom experience is that you forget things by the end of the semester...But students in flipped model can go back and see what the lecturer said in the beginning because it is **video recorded so they don’t miss anything**. In that sense, I think it’s a very big advantage especially in the **resources** part.” ~Tutor-048

“It’s more relaxed, you don’t have to be nervous... when the lecturer asks questions from us.” ~Student-116

Flipping or Flapping the Classroom?

Addressing the gap between didactic education and hands on performance, Hawks (2014) suggest that the flipped classroom model is a unique integration of behaviourism and constructivism in a learning context. The implementation of the flipped classroom in this study clearly echoes the claim. Table 2 shows a summary of the combination of independent learning experiences and collaborative ‘learn by doing’ activities, which resonates the lecturer’s voice:

“I truly believe that the majority of students would have achieved more if they experienced learning by watching, imitating, listening and by doing it themselves.”
~Lecturer

It is interesting to determine that the flipped classroom contributed to a seamless learning experience in which (1) students self-study in a relaxed and less restricted manner at their own space and pace, without ‘stressful moments’ when a lecturer asks a question in the traditional class setting; (2) ideally, students are well-prepared prior to the class and are confident to answer lecturers’ questions; and (3) more in-depth and

1
2
3
4 complicated questions can be asked in the flipped classroom without spending effort on
5
6 the fundamental concepts that can be self-studied. This seamless learning aspect is a
7
8 significant contribution to address more reserved cultures, where students may be too
9
10 shy to ask or to be asked questions in the classroom, afraid of responding to a question
11
12 with a 'wrong' answer and not wanting to waste other students' time or being annoyed
13
14 by individuals' 'silly' questions (see Table 2). Such focused and maximised use of the
15
16 flipped classroom is a worthwhile experience.
17

18
19 Conversely, Figure 4 depicts the 'flapping' responses for a flipped classroom.
20
21 Limited feedback and feed forward in the video lectures are one of the largest
22
23 frustrations. Students do not receive spontaneous feedback from the lecturer when
24
25 studying the pre-recorded video lectures. This is agreed by the interview participant:
26
27

28
29 "In the video lectures, there are some points that we cannot understand and then we
30
31 do not have the lecturer with us to ask the questions of. Therefore, we have to wait
32
33 another day or get an appointment to ask questions, and that's a bit troublesome."
34

35
36 ~Student-116

37
38 Second, excessive effort in the pre-self-study is also a challenge. Students need to spend
39
40 much more effort and pre-study times on independent learning prior to the flipped
41
42 classroom compared to the traditional delivery:
43

44
45 "The top negative thing [for flipped classroom pre-study]: you have to do it every
46
47 time. Sometimes, you really don't have time and you still have to do it just for the
48
49 few marks... you still need to allocate some times to do it." ~Student-058

50
51 "...it does require a certain degree of independence from the students. We have
52
53 some tutorials that are not marked which they're supposed to go back to do it by
54
55 themselves. Some do it; very few actually do the weekly tutorials." ~Tutor-048
56
57
58
59
60

Third, the concerns of the digital gap and the constraints of the technologies are raised. Mobile friendly learning content and speedy bandwidth are becoming basic requirements for students in the 21st century:

“Moodle is not quite mobile friendly as well. That’s true. A lot of students have to watch from their mobiles. But more importantly, Moodle is slow, very slow....it’d take forever to download. The video files are not small. They’re really big, and you’re really bandwidth-constricted.” ~Tutor-048

Although there are ‘flapping’ experiences as discussed, more than 85.56% students remain positive and recommend that flipped classroom should be implemented to other subject units. This is a very positive sign for flipping, not ‘flapping’ in the learning experiences.

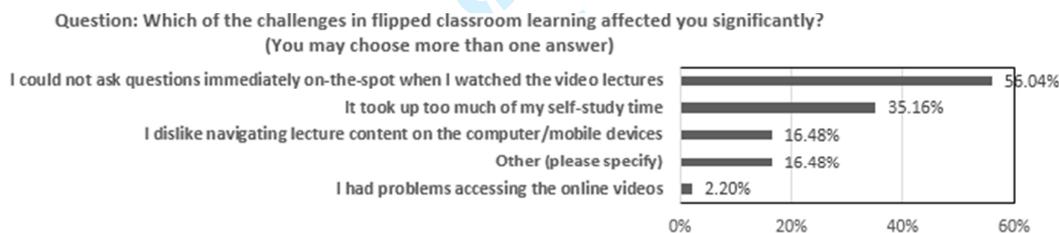
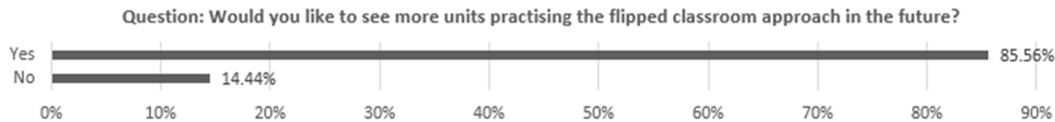


Figure 4. ‘Flapping’ Experiences

Recommendations and Reflections

Student respondents suggest that students should be provided a forum for feedback during the independent study sessions if there are any questions. A forum type option for each video lecture is preferred:

“After each video lecture, there should be a questions page which appears, which asks any questions we have...like a forum.” ~Student-116



10 **Figure 5.** Implementation of Flipped Classroom to other subject units

11
12
13
14 Figure 5 shows that majority would like to see more units practising the flipped
15 model. It is also recommended to conduct a pre-workshop for the flipped classroom to
16 motivate students' mind-set and prepare or manage students' expectations with regards
17 to the future flipped model:
18
19
20
21
22

23
24 "I think mind-set is the priority in life. It depends on your mind-set, like what you
25 want in life everything... can provide some workshop or anything... pre-workshop
26 for flipped classroom? Practice your mind-set." ~Student-086
27
28

29
30 Based on Table 2 and the flipping or flapping experience of this research, we
31 would propose flipping or flapping classroom principles depicted as:
32
33
34
35
36
37
38
39
40
41
42
43
44

45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Seamless learning in a relaxed and free way.

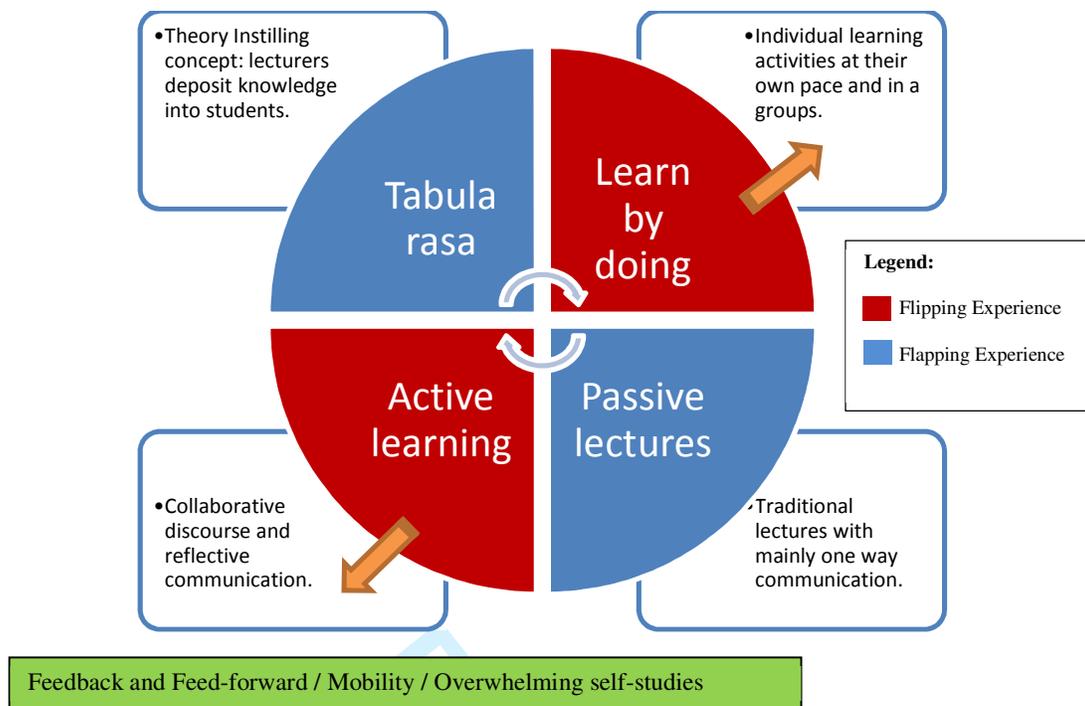


Figure 6. Flipping or Flipping Classroom Principles

The principles shown in Figure 6 attempt to describe what a flipped classroom does with the shift of pedagogy. The columns in green represents the aspects of how a flipped classroom can be further improved or strengthened. In a fully flipped classroom, ideally, the elements of *tabula rasa* and passive lectures are much smaller and are flipped to 'learn by doing' and active learning. This is a recommended seamless learning experience.

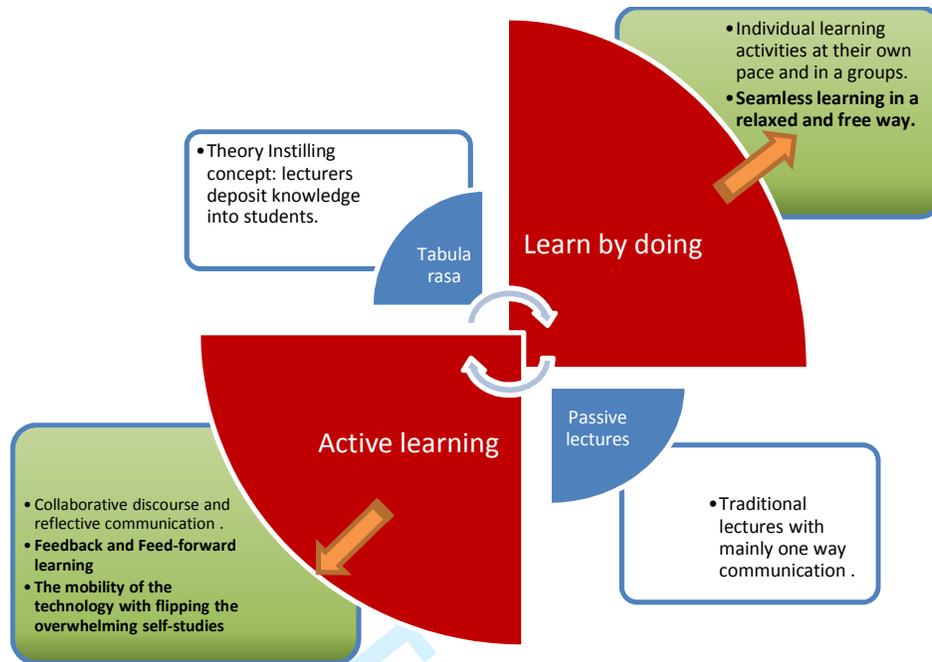


Figure 7. Ideal Flipped Classroom Model

The ideal Flipped Classroom Model as depicted in Figure 7 can be extrapolated across disciplines to add value in implementing the flipped classroom. The model can be generalised by further and larger scale of empirical testing with various disciplines in future work.

Conclusion, Limitation and Future work

This study has explored the flipped classroom model in an engineering subject unit in a private university in Malaysia. The emerging 'flipped' classroom model is pervasive across disciplines and continents because it evolved from a theory instilling delivery method to learning by doing and reflecting individual learning activities at their own pace or in groups. From passive lectures to active learning with collaborative discourse and reflective communication, flipping the classroom can offer a seamless learning

1
2
3
4 experience. Conversely, the significant effort required to develop the pre-lecture
5 independent learning materials and the provision of spontaneous feedback and feed
6 forward in the pre-recording video lectures are the current challenges. Technological
7 constraints such as lack of content and data mobility have yet to be resolved efficiently.
8
9

10
11
12 In this investigation, the small sample size with qualitative method and thematic
13 analysis employed led to considerable theoretical development (Gill, 1995; Rist, 1997)
14 but may not achieve the validity standards to generalise the findings as required. Further
15 empirical investigation with systematic controlled group is recommended for future
16 work across disciplines for extrapolation.
17
18
19
20
21
22

23
24 In summary, consider the enhanced and disruptive learning and teaching
25 experiences of the flipped classroom:
26
27

28
29 “I think that, in this level, we **should be responsible for our education. We must**
30 **be proactive and have the initiative.** It is my responsibility to learn first. Then, if
31 I don't know anything, I would ask the lecturer” ~Student-086
32
33

34
35 “With this system, I find that students were more willing to write, sketch, draw and
36 to do something during the crucial time spent with their lecturer in class. So, they
37 fill out worksheets together with me, and it seems that they could retain more skills
38 while they use their eyes, ears, brain and hands to have a better learning
39 experience.’ ~Lecturer
40
41
42
43
44
45
46
47
48
49
50
51

52 **References**

53
54
55
56
57
58
59
60

1
2
3
4 Acedo, M. (2013). 10 Pros and cons of a flipped classroom. Retrieved on 15 Nov 15
5
6 from: <http://www.teachthought.com/uncategorized/10-pros-cons-flipped-classroom/>
7

8
9
10 Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of*
11
12 *educational goals: Handbook I: Cognitive domain*. New York: Longmans, Green.
13
14

15
16
17 Boyer, A. (2013). The flipped classroom [online]. *TLN Journal*, 20(1), 28-29.

18 Retrieved on 20 Nov 16 from:
19
20 [http://search.informit.com.au.ezproxy.lib.monash.edu.au/documentSummary;dn=30282](http://search.informit.com.au.ezproxy.lib.monash.edu.au/documentSummary;dn=302825604903142;res=IELHSS)
21
22 [5604903142;res=IELHSS](http://search.informit.com.au.ezproxy.lib.monash.edu.au/documentSummary;dn=302825604903142;res=IELHSS)
23
24
25

26
27
28 Bryman, A. (2012) *Social research methods*, Oxford: Oxford University Press.
29

30
31
32 Chen, Y., Wang, Y., Kinshuk and Chen, N. (2014). Is FLIP enough? Or should we use
33
34 the FLIPPED model instead? *Computers and Education*, 79, 16-27. DOI:
35
36 <http://dx.doi.org/10.1016/j.compedu.2014.07.004>
37
38
39

40
41 Daniel, J. (2011) *Sampling Essentials: Practical Guidelines for Making Sampling*
42
43 *Choices*, Newcastle: Sage.
44
45

46
47
48 Dewey, J. (1960). *How we think: A restatement of the relation of reflective thinking to*
49
50 *the educative process*. Lexington, MA: D. C. Health and Company.
51
52
53
54
55
56
57
58
59
60

1
2
3
4 Flumerfelt, S., & Green, G. (2013). Using LEAN in the flipped classroom for at risk
5 students. *Journal of Educational Technology & Society*, 16(1), 356–366.
6
7

8
9
10 Freire, P. (1970). *Pedagogy of the oppressed*. New York: Continuum Publishing
11 Company.
12
13

14
15
16
17 Gecer, A., & Dag, F. (2012). A blended learning experience. *Educational Sciences:
18 Theory and Practice*, 12(1), 438–442.
19
20

21
22
23
24 Gilboy, M. B., Heinerichs, S. & Pazzaglia, G. (2015). Enhancing student
25 engagement using the flipped classroom, *Journal of Nutrition Education and
26 Behavior*, 47(1), 109-114.
27
28
29

30
31
32
33 Gill, J. (1995). Building theory from case studies, In Richardson, B.,
34 Montanheiro, L., Cinneide, B. O. (Ed), *How to Research, Write, Teach and
35 Publish Management Case Studies*. Sheffield: PAVIC, 17-27.
36
37
38

39
40
41
42 Glass, R., D. (2001). 'On Paulo Freire's Philosophy of Praxis and the Foundations of
43 Liberation Education', *Educational Researcher*, 30(2), 15-25.
44
45
46

47
48
49 Greg, G. (2012). *Applied thematic analysis*. Thousand Oaks, California: Sage.
50
51

52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000

1
2
3
4
5
6 Herreid, C., F. & Schiller, N. A. (2013). Case Study: Case Studies and the Flipped
7
8 Classroom, *Journal of College Science Teaching*, 42(5), 62-67.
9

10
11
12 Hiew, F. C. & Chew, E. (2016). Seams remain in seamless learning, *On the Horizon*,
13
14 24(2). <http://www.emeraldinsight.com/doi/abs/10.1108/OTH-09-2015-0063>
15
16

17
18
19 Hussey, H. D., Fleck, B. K., & Richmond, A. S. (2014). Promoting active learning
20
21 through a flipped course design. In J. Keengwe, G. Onchwari, & J. Oigara (Eds.)
22
23 *Promoting active learning through the flipped classroom model*, 23-46. Hershey, PA: .
24
25 doi:10.4018/978-1-4666-4987-3.ch002
26
27

28
29
30 Huyler, J. (1997). 'Was Locke a Liberal?' *Independent Review*, 1(4), 523.
31
32

33
34
35 Johnston, I. (1996). *Introduction to the Eighteenth Century and Rousseau's Emile*.
36
37 British Columbia: Malaspina University-College, Media Relations & Publications
38
39 Department.
40
41

42
43
44 Kengwe, J., Onchwari, G. & Oigara, J. N. (2014) *Promoting active learning through*
45
46 *the flipped classroom model*, Hershey: IGI Global. DOI: 10.4018/978-1-4666-4987-3
47
48

49
50
51 Khan Academy (2015) Khan Academy. Retrieved on 20 March 17 from:
52
53 <https://www.khanacademy.org/>.
54
55
56
57
58
59
60

1
2
3
4 Kong, S. C. (2014). Developing information literacy and critical thinking skills through
5 domain knowledge learning in digital classrooms: An experience of practicing flipped
6 classroom strategy, *Computers and Education*, 78 (2014), 160-173.
7
8
9

10
11
12
13 Locke, J. (1995). *An essay concerning human understanding*. ILT Digital Classics.
14
15

16
17
18
19 *McCrea, B. (2016) 6 Flipped Learning Technologies To Watch in 2016*, Retrieved
20 on 3 April 17 from: [https://thejournal.com/articles/2016/03/16/6-flipped-learning-](https://thejournal.com/articles/2016/03/16/6-flipped-learning-technologies-to-watch-in-2016.aspx)
21 [technologies-to-watch-in-2016.aspx](https://thejournal.com/articles/2016/03/16/6-flipped-learning-technologies-to-watch-in-2016.aspx)
22
23
24
25
26
27

28
29
30 Meyer, J. P. (2003). Four territories of experience: A developmental action inquiry
31 approach to outdoor adventure experiential learning, *Academy of Management Learning*
32 *& Education*, 2(4), 352- 363.
33
34
35
36

37
38
39 Ray, B. B., & Powell, A. (2014). Preparing to teach with flipped classroom in teacher
40 preparation programs. In J. Keengwe, G. Onchwari, & J. Oigara (Eds.) *Promoting*
41 *active learning through the flipped classroom model* (pp. 1-22). Hershey, PA:
42 doi:10.4018/978-1-4666-4987-3.ch001
43
44
45
46
47

48
49
50 Rist, R. (1977). On the relations among education research paradigms: from disdain to
51 détente, *Anthropology and Education*, 8(2), 42-50.
52
53
54
55
56
57
58
59
60

1
2
3
4 SurveyMonkey (2014). An Online Survey tool. Retrieved on 21 Dec 16 from:

5
6 www.surveymonkey.com
7
8

9
10 Schullery, N. M., Reck, R. F., & Schullery, S. E. (2011). Toward solving the high
11 enrollment, low engagement dilemma: A case study in introductory business.
12 *International Journal of Business, Humanities and Technology*, 1(2), 1–9.
13
14

15
16 Simpson, D. J. (2001) 'John Dewey's concept of the student', *Canadian Journal of*
17 *Education*, 26.
18
19

20
21 Strauss, A. L., & Corbin, J. M. (1998). *Basics of qualitative research: Grounded theory*
22 *procedures and techniques* (2nd ed.). Thousand Oaks, CA: Sage.
23
24

25
26 Tan, D. (2013). Listen, Listen! Have we gone overboard? *Free Malaysia Today*.

27
28 Retrieved on 18 March 17 from:

29
30 [http://www.freemalaysiatoday.com/category/opinion/2013/01/21/listen-listen-have-we-](http://www.freemalaysiatoday.com/category/opinion/2013/01/21/listen-listen-have-we-gone-overboard/)
31 [gone-overboard/](http://www.freemalaysiatoday.com/category/opinion/2013/01/21/listen-listen-have-we-gone-overboard/)
32
33

34
35 Torbert, W. (2001). The practice of action inquiry. In Reason, P. & Bradbury (Ed),
36 *Handbook of Action Research - Participative Inquiry and Practice*. London: Sage.
37
38

39
40 Tucker, B. (2012). The flipped classroom. *Education Next*, 12(1), 82-83.
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Youngkin, C. A. (2014). The flipped classroom: Practices and opportunities for Health Sciences Librarians, *Medical Reference Services Quarterly*, 33(4), 367-374.



Table 1. Typical Sequence in Flipped Classroom Approach

Week No.	Activity	Marks
1	Pre-Class: Watch several short video lectures (10-15 mins each, total duration is 1-1.5 h) uploaded on Moodle/YouTube. Complete a 20-min online quiz consisting, typically True or False and Multiple Choice Questions	~0.5% per Quiz for a total of 8%
2	Flipped Classroom: Students gather in the lecture hall to work through several worksheets in small groups and facilitated by the lecturer based on topics covered in video lectures and online quizzes before the start of this session.	
3	Tutorial: Lecturer or tutor stamp completed worksheets and provide simple verbal feedback on a one-to-one basis. Students are encouraged to practice on additional exercises from the recommended textbook and ask questions during this session.	~0.5% per Worksheet for a total of 8%

Table 2. Summary of Participants' Response**Theme 1:**

From *tabula rasa* (theory instilling) to learn by doing and reflective individual learning activities at their own pace or in a groups (Locke, 1995; Huyler, 1997; Glass, 2001; Gecer & Dag, 2012)

Responses:

"If you compare primary school, the teachers spoon-feed you everything. I mean at this level, you should **take the initiative and learn beforehand** and get to study everything first... to **be prepared** before the class,"

~Student-086

"We can learn **at any time we want.**" ~Student-116

"**The quizzes** are great ways to keep the students in touch with the video lectures- ensure that **you do the work**" ~Student-116

"With the flipped learning, it opened up more time for student involvement and having more face-to-face hours, **doing hands-on learning** in their labs, programming and having more guidance in their CAD skills."

~Lecturer

"The positive experience about this flipped classroom thing is that it helps me to **get ready** and helps me **keep consistent in pace** of what is happening throughout the whole semester" ~Student-058

"It does train the student to be more **independent**...instead of us having to explain to them you need to do

1
2
3 this do that.” ~Tutor-048
4

5 **Theme 2:**

6 From passive lectures to active learning with collaborative discourse and reflective
7 communication (Simpson, 2001; Ray & Powell, 2014; Youngkin, 2014)
8

9 **Responses:**

10 “Flipped classroom is like you go into the class, you **understand** the **background** and if there is any **question**
11 **you can ask**...it is better.” ~Student-086
12

13 “With the flipped classroom, you have a better interaction with the lecturer. Students highlight certain things
14 that they are not clear about, then the lecturer can pinpoint it.” ~Student-090
15

16 “I wanted to spend more face-to-face time with my students by demonstrating my thought process in solving
17 engineering-based problem and **getting them to do it with me, rather than making them sit together to**
18 **watch me talk for at least 1 to 2h**...and having a laid-back attitude if they were to go through a traditional
19 lecture in this decade”. ~Lecturer
20
21
22
23
24
25
26

27 **Theme 3:**

28 Seamless learning in a relaxed and uninterrupted manner (Hiew & Chew 2016)
29

30 **Responses:**

31 “The traditional way is very time consuming. And if you don’t know then you have to raise your hand and
32 ask, **that’d just stop the lecture**, so it’s not that efficient” ~Student-086
33

34 “Flipped classroom does give us more freedom **to do what we can do** to really help on those really **genuine**
35 **questions, those really complicated ones**.” ~Tutor-048
36

37 “In a typical classroom experience is that you forget things by the end of the semester...But students in flipped
38 model can go back and see what the lecturer said in the beginning because it is **video recorded so they don’t**
39 **miss anything**. In that sense, I think it’s a very big advantage especially in the **resources** part.” ~Tutor-048
40
41
42
43

44 “It’s more relaxed, you don’t have to be nervous... when the lecturer asks questions from us.” ~Student-116
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60