

## Appendix A – Literature Review Article Summary

Authors, Year	Discipline <sup>1</sup>	Contrasting Approach	Pre-class Activity	Linking Activity	In-Class Activity	Lvl <sup>2</sup>	Size <sup>3</sup>	Qual <sup>4</sup>	Quant <sup>5</sup>	Att <sup>6</sup>	Beh <sup>7</sup>	Perf <sup>8</sup>
Amiri, Ahrari, Saffar, & Akre, 2013	Multiple	Lecture	Repository video	-	Application, Collaboration, Discuss/Peer	U	100	Yes	Yes	Pos	Pos	-
Amresh, Carberry, & Femiani, 2013	Eng/Tech	Lecture	Instructor video	-	Application	U	39	Yes	Yes	Neg	-	Pos <sup>ns</sup>
Arnold-Garza, 2014	Skills	None	Instructor video	Explicit, In-class quiz	Directed, Discuss/Peer	U	148	Yes	Yes	Pos	Pos	-
Azemi, 2013	Eng/Tech	None	Instructor video	Review	Application, Collaboration, Discuss/Peer	U	-	Yes	Yes	-	Pos	Pos <sup>ns</sup>
Bijlani, Chatterjee, & Anand, 2013	Eng/Tech	None	Multimedia, Repository video, Supplements	Online quiz, Posting	Directed, Application, Discuss/Peer	G	7	Yes	No	Pos	-	-
Bishop, & Verleger, 2013b	Math/Sci	Lecture	Instructor video	Assignment, In-class quiz	Application, Collaboration, Discuss/Peer	U	164	No	Yes	-	-	-
Boucher, Robertson, Wainner, & Sanders, 2013	LS/Med	Lecture	Instructor video, Readings	Explicit	Application, Collaboration, Discuss/Peer	G	38	Yes	Yes	Pos	-	Mix
Butt, 2014	Math/Sci	Lecture	Readings	Posting, Review	Directed, Discuss/Peer	U	62	Yes	Yes	Pos	Pos	-

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Critz & Knight, 2013	LS/Med	None	Instructor video, Readings	Online quiz	Application, Collaboration, Discuss/Peer	G	20	Yes	Yes	Pos	Pos	-
Davies, Dean, & Ball, 2013	Skills	Lecture, Simulation	Instructor video, Readings	Assignment	Directed <sup>opt</sup>	U	190	Yes	Yes	Pos	-	Mix
Davis & Minifie, 2013	Bus/Mgt	None	Readings	Assignment, Explicit	Application, Discuss/Peer	U	-	Yes	Yes	Pos	-	Pos <sup>ns</sup>
Enfield, 2013	Art/Hum	None	Instructor video	In-class quiz	Directed	U	37	Yes	Yes	Pos	Pos	-
Ferreri & O'Connor, 2013	LS/Med	Lecture	Readings	Explicit	Application, Collaboration, Discuss/Peer	U	300	Yes	Yes	Mix	-	Pos
Findlay-Thompson & Mombourquette, 2014	Bus/Mgt	Lecture	Instructor video	Assignment	-	U	108	Yes	Yes	Mix	-	ND
Forsey, Low, & Glance, 2013	Art/Hum	None	Instructor video	In-class quiz	Collaboration, Directed, Discuss/Peer	U	74	Yes	Yes	Pos	Pos	Pos <sup>ns</sup>
Frydenberg, 2013	Skills	None	Instructor video	In-class quiz	Collaboration, Directed, Discuss/Peer	U	66	No	Yes	Pos	Pos	-
Gannod, Burge, & Helmick, 2008	Eng/Tech	None	Instructor video	Explicit	Directed, Discuss/Peer	U	24	Yes	Yes	Pos	Pos	-
Gaughan, 2014	Art/Hum	None	Instructor video, Readings, Supplements	Implicit	Directed, Collaboration, Discuss/Peer	U	36	Yes	Yes	Pos	Pos	-

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Guerrero, Baumgartel, & Zobott, 2013	Math/Sci	Active	Instructor video	-	Application, Collaboration, Discuss/Peer	U	49	Yes	Yes	Pos	Pos	ND
Herold, Lynch, Ramnath, & Ramanathan, 2012	Eng/Tecg	None	Collaboration, Instructor video*, Multimedia*, Readings*, Supplements*	Online quiz	Application, Directed	U, G	106	Yes	Yes	Pos	Pos	-
Hoffman, 2014	Soc-Sci	None	Collaboration, Instructor video <sup>opt</sup> , Readings, Supplements	-	Application, Directed, Discuss/Peer	G	17	Yes	Yes	Pos	Pos	-
Kellogg, 2009	Eng/Tech	None	Interactive, Readings	Online quiz	Application, Collaboration, Discuss/Peer	U	-	Yes	Yes	Pos	-	Pos <sup>ns</sup>
Kellogg, 2013	Eng/Tech	None	Interactive, Readings	Online quiz	Application, Collaboration, Discuss/Peer	U	-	Yes	Yes	Pos		Pos <sup>ns</sup>
Lage, Platt, & Treglia, 2000	Bus/Mgt	None	Instructor video*, Multimedia*, Readings*, Supplements*	Explicit	Application, Collaboration, Directed, Discuss/Peer	U	200	Yes	Yes	Pos	Pos	-

Authors, Year	Discipline <sup>1</sup>	Contrasting Approach	Pre-class Activity	Linking Activity	In-Class Activity	Lvl <sup>2</sup>	Size <sup>3</sup>	Qual <sup>4</sup>	Quant <sup>5</sup>	Att <sup>6</sup>	Beh <sup>7</sup>	Perf <sup>8</sup>
Larson & Yamamoto, 2013	Skills	Lecture	Readings, Repository video <sup>opt</sup>	-	Application	U	125	Yes	Yes	Pos	-	ND
Lasry, Dugdale, & Charles, 2014	Math/Sci	None	Readings, Repository video, Supplements	Explicit	Directed, Collaboration, Discuss/Peer, Reflection	U	-	No	No	Pos	Pos	-
Love, Hodge, Grandgenett, & Swift, 2014	Math/Sci	Lecture	Instructor video, Readings, Supplements	Online quiz	Application, Collaboration, Discuss/Peer	U	55	No	Yes	Pos	-	ND
Lucke, Keyssner, & Dunn, 2013	Eng/Tech	None	Interactive	Assignment, Explicit	Application, Collaboration, Discuss/Peer	U	35	Yes	Yes	Pos	Pos	ND <sup>ns</sup>
Mason, Shuman, & Cook, 2013a	Eng/Tech	Lecture	Instructor video	Online quiz	Application, Collaboration, Discuss/Peer	U	40	Yes	Yes	Pos	Pos	Pos
Mason, Shuman, & Cook, 2013b	Eng/Tech	Lecture	Instructor video	Online quiz	Application, Collaboration, Discuss/Peer	U	60	Yes	Yes	Pos	-	ND
McGivney-Burelle & Xue, 2013	Math/Sci	Lecture	Instructor video	In-class quiz	Application, Collaboration, Discuss/Peer	U	60	Yes	Yes	Pos	Pos	Pos <sup>ns</sup>
McLaughlin et al., 2013	LS/Med	Lecture	Instructor video	Implicit	Application, Collaboration, Directed, Discuss/Peer	U	19	Yes	Yes	Pos	Pos	ND

Authors, Year	Discipline <sup>1</sup>	Contrasting Approach	Pre-class Activity	Linking Activity	In-Class Activity	Lvl <sup>2</sup>	Size <sup>3</sup>	Qual <sup>4</sup>	Quant <sup>5</sup>	Att <sup>6</sup>	Beh <sup>7</sup>	Perf <sup>8</sup>
McLaughlin et al., 2014	LS/Med	Lecture	Instructor video	Implicit	Application, Collaboration, Directed, Discuss/Peer	U, G	150	Yes	Yes	Pos	Pos	Pos
Missildine, Fountain, Summers, & Gosselin, 2013	LS/Med	Lecture	Recorded lecture	-	Collaboration, Directed	U	589	No	Yes	Neg	-	Pos
Murphree, 2014	Art/Hum	None	Readings	Explicit	Application, Discuss/Peer	U	85	Yes	Yes	Pos	-	-
Pierce & Fox, 2012	LS/Hum	None	Recorded lecture	Implicit	Application, Collaboration, Discuss/Peer	U	71	No	Yes	Pos	Pos	Pos
Ryan, 2013	LS/Hum	None	Collaboration	Assignment, Implicit	Directed	U	-	Yes	Yes	Pos	Pos	-
Sadaghiani, 2012	Math/Sci	None	Interactive	-	Directed	U	138	Yes	Yes	Pos	Pos	Pos <sup>ns</sup>
Sales, 2013	Soc-Sci	None	Online video	Explicit	Directed, Discuss/Peer	U	-	Yes	No	Pos	Pos	-
Schwartz, 2014	Math/Sci	None	Instructor video	-	Collaboration, Directed, Discuss/Peer	G	9	Yes	Yes	Pos	-	ND <sup>ns</sup>
Slomanson, 2014	Soc-Sci	None	Instructor video	Assignment	Application, Collaboration, Directed, Discuss/Peer	G	139	Yes	Yes	Pos	Pos	-
Strayer, 2012	Math/Sci	Lecture	Interactive	Implicit	Application	U	50	Yes	Yes	Mix	Pos	-

Authors, Year	Discipline <sup>1</sup>	Contrasting Approach	Pre-class Activity	Linking Activity	In-Class Activity	Lvl <sup>2</sup>	Size <sup>3</sup>	Qual <sup>4</sup>	Quant <sup>5</sup>	Att <sup>6</sup>	Beh <sup>7</sup>	Perf <sup>8</sup>
Talley & Scherer, 2013	LS/Med	Lecture	Instructor video, Readings, Supplements	Practice quiz	Directed, Discuss/Peer	U	-	Yes	Yes	Pos	-	Pos
Taylor, McGrath-Champ, & Clarkeburn, 2012	Bus/Mgt	None	Readings, Supplements	Implicit	Application, Collaboration, Discuss/Peer, Reflection	U, G	461	Yes	Yes	Pos	-	-
Toto & Nguyen, 2009	Eng/Tech	None	Instructor video	In-class quiz	Application, Directed	U	74	No	Yes	Pos	-	-
Tune, Sturek, & Basile, 2013	LS/Med	Lecture	Instructor video, Readings, Supplements	In-class quiz	Application, Discuss/Peer	G	27	No	Yes	Mix	Pos	Pos
Van Veen, 2013	Eng/Tech	None	Instructor video, Readings	Implicit	Application	U, G	55	Yes	Yes	Pos	Pos	Pos
Wilson, 2013	Math/Sci	None	Readings, Repository video <sup>opt</sup>	Online quiz	Application, Reflection	U	50	Yes	Yes	Pos	Pos	Pos

Authors, Year	Discipline <sup>1</sup>	Contrasting Approach	Pre-class Activity	Linking Activity	In-Class Activity	Lvl <sup>2</sup>	Size <sup>3</sup>	Qual <sup>4</sup>	Quant <sup>5</sup>	Att <sup>6</sup>	Beh <sup>7</sup>	Perf <sup>8</sup>
Yeung & O'Malley, 2014	Math/Sci	None	Instructor video	-	Application, Directed	U, G	52	Yes	Yes	Pos	-	-

## Notes:

<sup>1</sup> Academic discipline: Art/Hum – Arts/Humanities, Bus/Mgt – Business/Management, Eng/Tech – Engineering/Technology, Skills -Technical Skills, LS/Med - Life Science/Medicine, Math/Sci – Math/Science, Soc-Sci – Social Science.

<sup>2</sup> Academic level: U – Undergraduate, G – Graduate.

<sup>3</sup> Sample Size.

<sup>4</sup> Study utilized qualitative data sources such as open-ended survey questions or interviews.

<sup>5</sup> Study utilized quantitative data sources such as Likert-scale surveys or grade data.

<sup>6</sup> Impact on student attitudes: Pos – positive, Mix – mixed, Neg – negative, ND – no difference.

<sup>7</sup> Impact on student behaviours: Pos – positive, Mix – mixed, Neg – negative, ND – no difference.

<sup>8</sup> Impact on student performance: Pos – positive, Mix – mixed, Neg – negative, ND – no difference.

\* Students choose between multiple alternative formats.

<sup>opt</sup> Student use optional.

<sup>ns</sup> Statistical significance not reported.

## Appendix B – Letter of Information

### Letter of Information

You are invited to participate in a research study being conducted by Thom MacDonald. This research is being conducted in partial fulfilment of a Master's Degree, under the supervision of Dr. Robin Kay of University of Ontario Institute of Technology (UOIT). The purpose of this study is to gain insight into using specific teaching approaches in a computer programming course at the college-level.

You will be asked to complete a 20-minute on-line survey. This is one of a series of surveys you will be asked to complete. Questions in this survey will focus on demographic information, computer and programming skill level, and your opinions about in-class and out-of-class learning. Completion of this and any other survey in this study is voluntary. There are no foreseeable risks to you to participate in this study, and you do not waive any rights to legal recourse in the event of research-related harm by participating. Note that there are no repercussions to you if you choose not to participate.

Any information you provide is confidential and anonymous. No potentially identifying information will be linked to your responses. At the outset of this course you were provided with a unique code. In order to preserve your anonymity, no record is kept that can link this code to your identity. You may choose to provide this unique code when completing this survey; however this option is your decision.

The only people that will have access to the data you provide are Thom MacDonald and Dr. Kay. Survey data from this study will be stored securely for five years after any paper authored by Thom and/or Dr. Kay resulting from this study is published, at which point the data will be deleted.

You are not obliged to answer any questions that you find objectionable or that make you feel uncomfortable. While completing the survey, you may withdraw your participation from this study at any time without consequence by clicking the "Discard responses and exit" button. Please note that it will not be possible to delete responses from an anonymous survey that you have already submitted.

Although there may be no immediate benefit to your participation in this study, your contributions may serve to inform instructors about better teaching approaches for future courses. The findings of this study may be reported in educational journals or presented at conferences, but any information shared will be aggregated so that individual participants cannot be identified. If you are interested in receiving a copy of the study findings, you can contact Thom.

This study has been reviewed and accepted by the Research Ethics Board at University of Ontario Institute of Technology (UOIT) (REB # 13-042).

### Consent Decision

By selecting "I agree to participate" below, you confirm that you:

- are 18 years of age or older and have the legal authority to consent to participate;
- understand what is required based on reading the Letter of Information and had any questions answered to your satisfaction;
- understand your right to refuse to respond to material that you find objectionable or makes you uncomfortable;
- understand that your participation is voluntary and that you free to withdraw at any time without consequence by exiting the survey; and
- understand that your identity is confidential and your responses are anonymous.

I agree to participate.

I do not agree to participate.



## Appendix C – Demographic/Culture of Learning Survey Questions

1. What is your age?
  - Under 20
  - 20 - 24
  - 25 - 29
  - 30 - 34
  - 35 - 39
  - 40 - 44
  - 45 - 49
  - 50 and over
  
2. Please indicate your program.
  - Computer Programmer
  - Computer Programmer Analyst
  - Computer Systems Technician
  - Computer Systems Technology
  
3. Please select your section number (CRN).
  - 21153
  - 23901
  - 26528

4. Computing Comfort and Skills. Please select your level of agreement with the following statements:

*(Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree)*

- a. I am comfortable using a computer.
  - b. I can use and manage e-mail and/or other forms of direct messaging (e.g. Skype™).
  - c.\* I can organize and manage files, folders, and drives (e.g. create, locate, move, delete).
  - d.\* I can create and edit documents using productivity software (i.e. word processing, spreadsheets, presentation software).
  - e. I can create and edit basic media files (i.e. images, sound recordings, online videos).
  - f.\* I can usually find what I am looking for on the Internet.
  - g.\* I can use the college learning management system.
  - h. I can use the college portal website (i.e. MyCampus).
  - i. I can use one or more social networking websites (e.g. LinkedIn™, Facebook™), including manage my profile, basic settings, etc.
  - j.\* I can use a blog, wiki, and/or online discussion board to share and discuss content.
  - k.\* I can usually troubleshoot and fix basic problems with my computer with minimal help.
  - l. I can install new software with minimal help.
- 

Note:

\* Computing skills required for the blended learning environment of the course.

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5. Please rate your programming skill level.

- Beginner - I need help to write a simple program.
- Developing - I can write a program with some help, but I am just learning.
- Intermediate - I can write programs on my own but I could learn more.
- Advanced - I can write useful programs on my own and I help others learn.
- Expert - I write useful programs professionally and I frequently help others learn

6. Please rate your interest level in programming.

- Not at all interested
- Slightly interested
- Moderately interested
- Very interested
- Extremely interested

7. In-Class Learning Activities. Please select your level of agreement with the following:  
(*Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree*)

- a. Listening to the instructor explain course concepts in a lecture helps my learning.
- b. Watching the instructor demonstrate course concepts with practical examples helps my learning.
- c. Discussing course concepts as a class helps my learning.
- d. Discussing course concepts in small groups in class helps my learning.
- e. Working on hands-on problems on my own in class helps my learning.
- f. Working on hands-on problems in small groups in class helps my learning.
- g. Being guided by the instructor through hands-on problems as a class helps my learning.

8. Out-of-Class Learning Activities. Please select your level of agreement with the following:

(*Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree*)

- a. Reviewing course materials (e.g. textbook, lecture notes) before class helps my learning.
- b. Reviewing course materials (e.g. textbook, lecture notes) after class helps my learning.
- c. Completing pre-class assignments (e.g. assigned readings and quizzes) helps my learning.
- d. Working on hands-on homework problems on my own helps my learning.
- e. Working on hands-on homework problems in small groups helps my learning.

9. Out-of-Class Time. Please select the range of hours-per-week that best matches your choice:

(*Less than 1 hr/week, 1 - 2 hr/week, 2 - 4 hr/week, 4 - 6 hr/week, 6 - 8 hr/week, 8 - 10 hr/week, Over 10 hr/week*)

- a. How much work outside of class is typical for one college course?
- b. What is the maximum amount of work outside of class you have spent for one college course?

## Appendix D – Post-Unit Survey Questions

### Teaching and Guidance

Please select your level of agreement with the following statements:

*(Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree)*

1. The instructor clearly communicated how the learning activities contributed to the goals for this unit.
2. <sup>L/A</sup> The instructor clearly communicated the student participation expectations for lectures/demonstrations.<sup>1</sup>
2. <sup>A/C</sup> The instructor provided clear instructions on how to participate in in-class guided/group activities.<sup>1</sup>
2. <sup>Flip</sup> The instructor provided clear instructions on how to complete pre-class video assignment(s)<sup>1</sup>
3. <sup>L/A</sup> The instructor provided clear instructions on how to complete individual homework problems.<sup>2</sup>
3. <sup>A/C</sup> I clearly understood what I needed to do outside of class to help me learn.<sup>2</sup>
3. <sup>Flip</sup> The instructor provided clear instructions on how to participate in in-class guided/group activities.<sup>2</sup>
4. The instructor was helpful in guiding the class towards understanding unit topics in a way that helped me clarify my thinking.
5. <sup>L/A</sup> Solving homework problems on my own<sup>3</sup> helped me to learn.
5. <sup>A/C</sup> Solving problems in-class in small groups<sup>3</sup> helped me to learn.
5. <sup>Flip</sup> Solving problems in-class in small groups<sup>3</sup> helped me to learn.
6. The instructor helped keep the course participants on task during this unit in a way that helped me to learn.
7. The instructor encouraged course participants to explore new concepts in this unit.
8. Instructor actions during this unit reinforced the development of a sense of community among course participants.
9. The instructor provided useful feedback during this unit.
10. The feedback provided during this unit was when I needed it.

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#### Notes:

<sup>L/A</sup> Lecture/assignment approach question version.

<sup>A/C</sup> Active/collaborative approach question version.

<sup>Flip</sup> Flipped classroom approach question version.

<sup>1</sup> Refers to initial exposure to unit learning prescribed by the teaching approach.

<sup>2</sup> Refers to subsequent exposure to unit learning prescribed by the teaching approach.

<sup>3</sup> Refers to problem solving in the format prescribed by the teaching approach.

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**Group Interaction**

Please select your level of agreement with the following statements:

*(Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree)*

11. My interaction with other course participants during this unit gave me a sense of belonging in the course.
  - 12.<sup>L/A</sup> The lecture/demonstrations<sup>1</sup> for this unit provided an excellent medium for in-class interaction between course participants.
  - 12.<sup>A/C</sup> The guided/group activities<sup>1</sup> for this unit provided an excellent medium for in-class interaction between course participants.
  - 12.<sup>Flip</sup> The guided/group activities<sup>1</sup> for this unit provided an excellent medium for in-class interaction between course participants.
  13. I felt comfortable participating in discussions in class for this unit.
  14. I felt comfortable disagreeing with other course participants while still maintaining a sense of trust during this unit.
  15. I felt that my point of view was acknowledged by other course participants during this unit.
  16. In-class discussions during this unit helped me to develop a sense of team-work.
- 

**Notes:**

<sup>L/A</sup> Lecture/assignment approach question version.

<sup>A/C</sup> Active/collaborative approach question version.

<sup>Flip</sup> Flipped classroom approach question version.

<sup>1</sup> Refers to in-class learning activities prescribed by the teaching approach.

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**Thinking and Learning**

Please select your level of agreement with the following statements:

*(Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree)*

17. The problems posed in this unit increased my interest in C++/programming.
  18. I felt motivated to explore C++/programming related questions.
  19. I utilized a variety of information sources to explore problems posed in this unit.
  20. In-class discussions during this unit were valuable in helping me appreciate different perspectives.
  21. <sup>L/A</sup> A pre-class video assignment(s) for this unit would not have made in-class discussions better.
  21. <sup>A/C</sup> A pre-class video assignment(s) for this unit would not have made in-class discussions better.
  21. <sup>Flip</sup> The pre-class video assignment(s) for this unit made in-class discussions better.
  22. The learning activities for this unit helped me learn what I needed to know.
  23. I have developed solutions to problems that I can apply in practice.
- 

Notes:

<sup>L/A</sup> Lecture/assignment approach question version.

<sup>A/C</sup> Active/collaborative approach question version.

<sup>Flip</sup> Flipped classroom approach question version.

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**Difficulty Level**

Please rate the difficulty level of each of the following:

*(Far Too Easy, Too Easy, About Right, Too Hard, Far Too Hard)*

24. <sup>L/A</sup> Rate the difficulty level of the content presented in the lecture/demonstrations<sup>1</sup>:
  24. <sup>A/C</sup> Rate the difficulty level of the in-class guided/group activities<sup>1</sup>:
  24. <sup>Flip</sup> Rate the difficulty level of the in-class guided/group activities<sup>1</sup>:
  25. Rate the difficulty level of your work outside of class for this unit:
- 

Notes:

<sup>L/A</sup> Lecture/assignment approach question version.

<sup>A/C</sup> Active/collaborative approach question version.

<sup>Flip</sup> Flipped classroom approach question version.

<sup>1</sup> Refers to in-class learning activities prescribed by the teaching approach.

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**Time Investment**

Please rate your level of time investment for each of the following:

*(Far Too Little, Too Little, About Right, Too Much, Far Too Much)*

26. <sup>L/A</sup> Rate the amount of time we spent in lecture/demonstrations<sup>1</sup> for this unit:
  26. <sup>A/C</sup> Rate the amount of time we spend on in-class guided/group activities<sup>1</sup>:
  26. <sup>Flip</sup> Rate the amount of time we spend on in-class guided/group activities<sup>1</sup>:
  27. Rate the amount of time you spent on work outside of class for this unit:
- 

Notes:

<sup>L/A</sup> Lecture/assignment approach question version.

<sup>A/C</sup> Active/collaborative approach question version.

<sup>Flip</sup> Flipped classroom approach question version.

<sup>1</sup> Refers to in-class learning activities prescribed by the teaching approach.

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**Value and Preference**

Please select your level of agreement with the following statements:

*(Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree)*

28. <sup>L/A</sup> The lecture/demonstrations<sup>1</sup> for this unit were worthwhile.
28. <sup>A/C</sup> The in-class guided/group activities<sup>1</sup> for this unit were worthwhile.
28. <sup>Flip</sup> The in-class guided/group activities<sup>1</sup> for this unit were worthwhile.
29. The work I did outside of class for this unit was worthwhile.
30. <sup>L/A</sup> The teaching approach for this unit (i.e. lecture/assignment)<sup>2</sup> was a good way for me to meet my learning goals.
30. <sup>A/C</sup> The teaching approach for this unit (i.e. in-class guided/group activities)<sup>2</sup> was a good way for me to meet my learning goals.
30. <sup>Flip</sup> The teaching approach for this unit (i.e. pre-class video assignment(s) and in-class guided/group activities)<sup>2</sup> was a good way for me to meet my learning goals.
31. <sup>L/A</sup> I would prefer most of my courses to follow this teaching approach (i.e. lecture/assignment)<sup>2</sup>.
31. <sup>A/C</sup> I would prefer most of my courses to follow this teaching approach (i.e. in-class guided/group activities)<sup>2</sup>.
31. <sup>Flip</sup> I would prefer most of my courses to follow this teaching approach (i.e. pre-class video assignment(s) and in-class guided/group activities)<sup>2</sup>.

**Notes:**

<sup>L/A</sup> Lecture/assignment approach question version.

<sup>A/C</sup> Active/collaborative approach question version.

<sup>Flip</sup> Flipped classroom approach question version.

<sup>1</sup> Refers to in-class learning activities prescribed by the teaching approach.

<sup>2</sup> Refers to all learning activities prescribed by the teaching approach.

**Benefits and Challenges**

32. <sup>L/A</sup> What were the benefits of the lecture/assignment teaching approach<sup>1</sup> for you?

32. <sup>A/C</sup> What were the benefits of the active learning approach<sup>1</sup> for you?

32. <sup>Flip</sup> What were the benefits of the flipped teaching approach<sup>1</sup> for you?

33. <sup>L/A</sup> What were the challenges of the lecture/assignment teaching approach<sup>1</sup> for you?

33. <sup>A/C</sup> What were the challenges of the active learning approach<sup>1</sup> for you?

33. <sup>Flip</sup> What were the challenges of the flipped teaching approach<sup>1</sup> for you?

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**Notes:**

<sup>L/A</sup> Lecture/assignment approach question version.

<sup>A/C</sup> Active/collaborative approach question version.

<sup>Flip</sup> Flipped classroom approach question version.

<sup>1</sup> Refers to the teaching approach used in the unit.

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## Appendix E – Qualitative Data Theme Descriptions

Category:	Subcategory Theme	Description
Cognitive Presence:	<i>Engagement</i>	
	Promoting Interest	The impact on interest in computer programming.
	Sustaining Attention	The ability to pay sufficient attention.
	<i>Knowing and Understanding Basic Concepts</i>	
	Ability/Ease	The ability or level of difficulty to achieve basic concepts comprehension.
	Explained Examples	The impact of the instructor explaining example code in class.
	Learning by Doing	Hands-on activity and its value to achieve basic concepts comprehension.
	Pressure/Stress	The presence of pressure/stress.
	Review for Comprehension	The value of materials (activity products, videos, example code/slides) to review for basic concepts comprehension.
	Technical Content/Syntax	The ability to comprehend technical details like syntax and keywords.
	Theoretical Content	The ability to comprehend theoretical content.
	Time to Absorb Content	The suitability of pace of the content/activities.
	<i>Integrating and Applying Learning</i>	
	Ability/Ease	The ability or level of difficulty to apply concepts to a contextual problem (i.e. lab-project).
	Explore/Experiment	The opportunity to explore/experiment.
In-Class Time Allocation	The suitability of the time allocated to lab-project work in class.	
Reference for Application	The value of materials (activity products, videos, example code/slides) as a reference to assist in application.	

Category:	Subcategory Theme	Description
Teaching Presence:		
	<i>Design/Organization</i>	
	Assignment/Activity	The clarity of lab-project requirements and pre-class assignment instructions.
	Instructions	
	Class Size	The suitability of the number of students in class.
	Content Segmenting	How learning content was broken-down and its impact.
	Grading/Incentive	How grades were assigned and its impact.
	Novelty	If the approach featured novel elements.
	Time/Place Flexibility	If and how the approach allowed time/place flexibility.
	Topic Coverage Efficiency	The amount of content covered in a fixed amount of time.
	<i>Direct Instruction</i>	
	Amount/Clarity	The amount and clarity of direct instruction.
	Detailed Explanation	The degree of detailed explanation afforded by direct instruction.
	Signaling Priority	The degree to which direct instruction signaled what content was important.
	<i>Guidance/Feedback</i>	
	Available When Needed	Whether guidance and feedback was available when students required it.
	Peer Support	Guidance and feedback from peers and its impact.
	<i>Independent Learning</i>	
	Self-Direction	The opportunity/need for students to direct their own learning and its impact.
	Workload	The amount of work required outside of class and its impact.

Category:	Subcategory Theme	Description
Social Presence:		
	<i>Cohesion</i>	
	Group Identity	The degree to which the students identify with the class-group.
	Keeping Pace in Class	Students keeping pace with one another in class and its impact.
	<i>Collaboration</i>	
	Class-Level Discussion	Class-level discussion and its impact.
	Interdependence	If and how an individual's learning was effected by the aptitude and behaviour of others.
	Small Group Work	Small group work and its impact.
General:		
	<i>General Assessment</i>	
	Affinity	Liking or disliking the approach as a whole.
	Learning/Self-Efficacy	Subjective assessment of the impact on learning in general.
	No Benefits/No Challenges	Lacking benefit (-) or lacking challenge (+). Only where explicitly stated; non-entry excluded.