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Flipped Classroom

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Abstract

This paper describes the implementation of Flipped Classroom Strategy in the Singapore Primary School context. Recent studies suggested that students today are no longer engaged with teacher-centered lessons. It is essential to create student-centered learning experiences that provide opportunities to help them acquire knowledge for themselves [1]. This resonated with the teachers as a common problem that educators face.

Flipped classroom is defined as using technology to teach content via lectures outside of the classroom, while assignments with concepts are provided inside the classroom through learning activities [2]. In the implementation of the Flipped Classroom Strategy, content is delivered online and students share their understanding of the lessons by discussing what they have learnt through online learning platforms such as forums and classroom discussions. In class, lessons were carefully planned and crafted to allow students to transfer their learning and understanding in class and to integrate the learning online and application in the classroom.

The Flipped Classroom Strategy is implemented during science lessons to address the following issues: 1. Encourage deeper learning and enhance classroom discussions 2. Move away from assumption that learning only takes place in the classroom.

Students' interactions and responses for the out-of-class and in-class learning were analysed. Results showed that students were able to produce more coherent, sophisticated and scientific explanations in their responses during the in-class activity compared to the out-of-class activity. Students were also able to bring in new information from reading materials to seek better understanding of issues involved and a positive trend in the quality of explanation and scientific-ness of content in their responses was observed.

Method

The true benefit of flipped learning is that the knowledge gained from viewing online resources during out-of-class activities is assimilated in class via learning through activities that engage the students during the in-class activities. Thus the out-of-class and in-class activities must be carefully designed and integrated for students to understand the concepts involved and be motivated for deeper learning through building on one another's knowledge. The following design principles were considered for the development of the flipped classroom structure:

1. Student ownership
2. Collaboration
3. Making thinking visible
4. Assessment
5. Teacher as a facilitator of learning

Based on the design principles listed, the following structure were carried out to engage students during out-of class activities and build on the understanding in-class:

<u>Out-of-class activity</u>

i. **Contexts** for students to ask questions and make predictions
   - ➢ Appropriate triggers and scaffolds provide the context for student-generated questions which helps build student ownership of learning and moves inquiry forward.

ii. **Scaffolds**, e.g. thinking routine (I see – I think – I wonder) to document students' thinking after watching online videos
   - ➢ This makes thinking visible and also inculcates ownership by prompting questioning by students.

iii. **Cues and examples** for students' reference
   - ➢ This reflects the role of teachers in demonstrating examples to scaffold students in completing a task independently.

iv. Using students' questions for in-class discussion
   - This reflects the role of teachers in providing spontaneous instruction by identifying questions worth investigating to move inquiry forward during in-class activity.

In-class activity

i. **Checking understanding** of out-of-class activity (e.g. narration of story)
   - Mastery check is formative assessment of students' learning to check students' understanding of out-of-class activity based on specific learning outcomes.

ii. **Scaffolds** for students' discussion (e.g. My question is, I need to know, My evidence is …, My conclusion is …)
   - This unpacking of questions helps to sustain inquiry and deepen students' understanding of content and concepts.

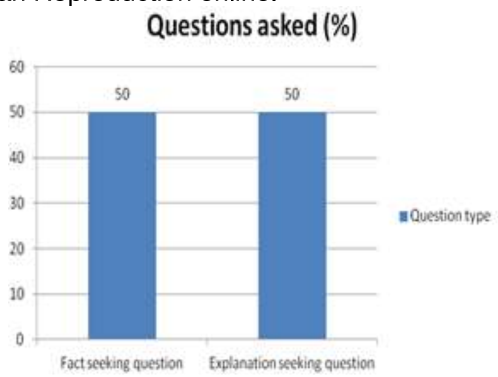
iii. **Experiments** to test students' predictions

iv. **Consolidation of learning** through presentations and completion of worksheets

Results

i) Questions asked online

Students asked an equal number of fact seeking questions and explanation seeking questions after watching the video on Human Reproduction online.



(*Human Reproduction P5A & P5P combined)*

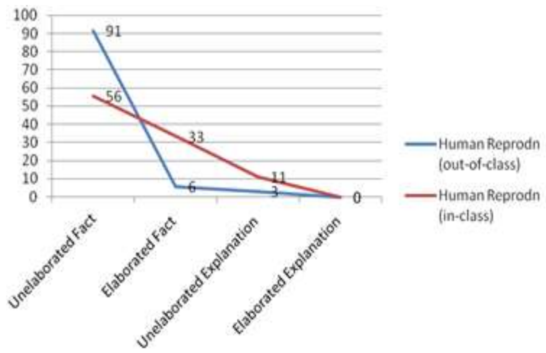
The result is encouraging given that research studies indicate that students' questions are mostly factual questions [3]. This suggests that the use of appropriate triggers (e.g. online videos) and scaffolds (e.g. thinking routines) provide the context for students to encounter concepts and ask questions worth investigating to understand more about the world around them.

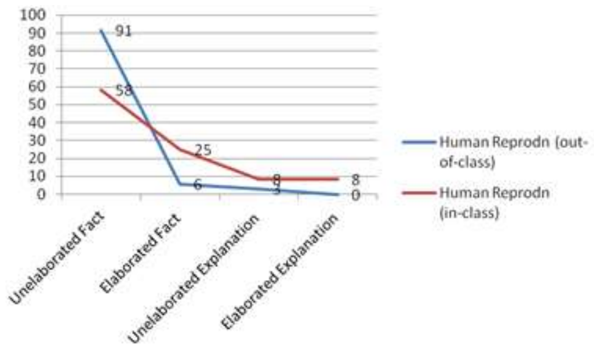
This is essential as it builds student ownership of learning and moves inquiry forward when students work on these student-generated questions during in-class activities.

ii) Quality of Explanation

The quality of explanation refers to how well students are able to explain, i.e. build explanation from various facts or only state facts related to inquiry question.

The results suggest a **gradual shift in quality of explanation from unelaborated facts to elaborated explanation** when comparing students' individual online explanations and collaborative face-to-face explanations for both classes.





Quality of

Explanation %

(Human Reproduction P5A)

Quality of Explanation %

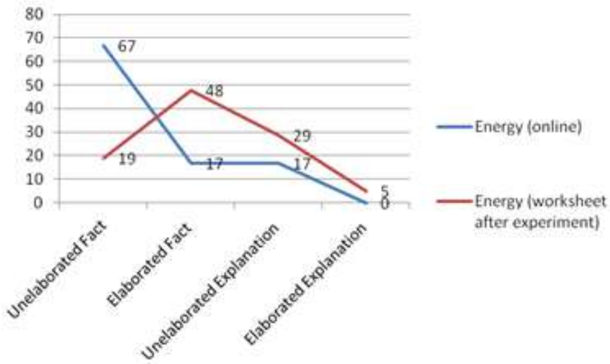
(Human Reproduction P5P)

This suggests that students contribute and build on one another's contributions to construct knowledge together when they **collaborate** and bring in new information from reading materials to seek better and deeper understanding of issues involved.

The opportunities to work with their **own questions** generated during out-of-class activities, coupled with **teachers' facilitation** during in-class activities through the use of appropriate scaffolds and verbal input helped students discover more and understand and explain the concepts better.

For the lesson on "Energy", the students worked in pairs to conduct **experiments** with catapults to understand the conversion of energy. This suggests that the experiment helped students gain a deeper understanding of the concepts involved and hence contributed to better explanations by the students.

The out-of-class activities set the **context** for students to make predictions and build their own catapults (as demonstrated by teachers) which they then used for **investigation** during in-class activities.

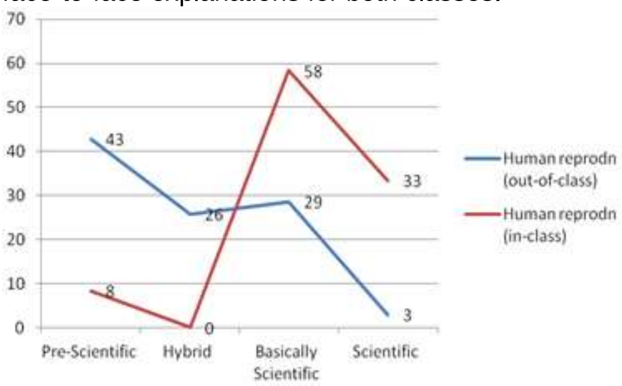


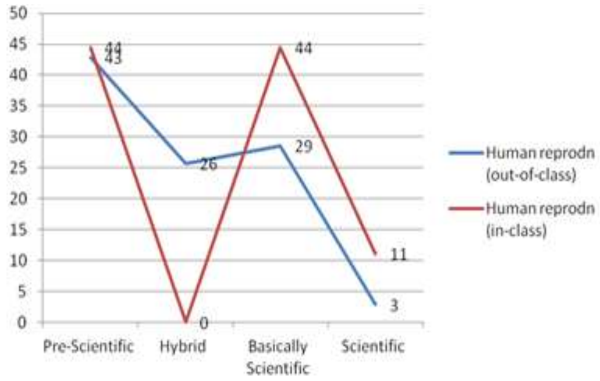
Quality of Explanation %
(Energy P5A & P5P combined)

iii) Scientificness of Content

The scientificness of content refers to how accurately scientific information is used.

The results suggest a **gradual shift in scientificness of content from pre-scientific (intuitive framework) to scientific** when comparing students' individual online explanations and collaborative face-to-face explanations for both classes.





Scientificness of Content %

(Human Reproduction P5A)

Scientificness of Content %

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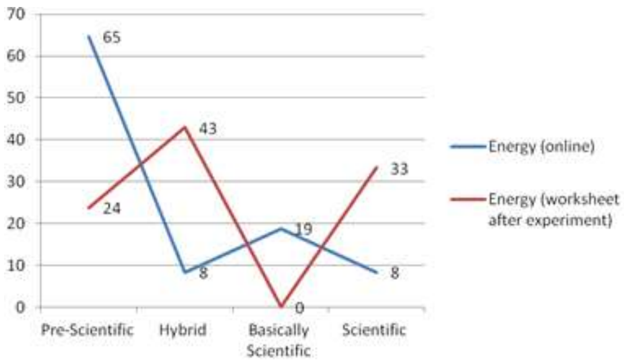

Scientificness of Content %
(Energy P5A & P5P combined)

Reflection

i. <u>Students' reflections</u>

Students enjoyed the lessons due to the discussions and hands-on activities, (e.g.*"I enjoyed the lessons this way with discussions and hands-on")*. They indicated that these enabled them to be more attentive in their work, think more deeply about the content, ask more questions and explain better, (*e.g. "in the topic we learned longer, more and deeper")*. They also looked for relevant information *(e.g. for human reproduction system, because we can use the computer to search what we want and we can ask the teacher")* and liked building on one another's answers in class *(e.g. yes helped to build on each other's answers and liked doing it.")*. They indicated that they learned to better manage learning online by setting aside time to watch videos and responding to the questions, and developed new skills in looking for information on things they didn't understand. They however **had some difficulty responding to their classmates' posts** and **did not read or respond to their peers' comments** *(e.g. "don't know what to say about classmates' posts").*

ii. <u>Teachers' reflections</u>

The teachers indicated that the students were more engaged and thought more deeply as they were engaged in the activities (e.g. *reaffirmed that it's good to get students involved and engaged in hands-on and get them to think about what they are doing. Hence need to develop lessons so that students are engaged and when they are engaged they learn").*

Students were more self-directed and able to reinforce their own learning online as it was self-paced and non-threatening (e.g. *for flipped learning, students can watch video as many times they want and can reflect back on responses they gave and close the loop by going back and reflect on what they watched and go back to check again and revisit their own learning. Reinforce their own learning.")*

They questioned more both online and face-to-face, looked beyond the textbook to gather relevant information based on what they wanted to know and build on one another's knowledge. (e.g. *platform where students presented artefacts honed communication skills as students don't normally present answers. Also for friends to affirm if they are right. Collaborative learning and opportunity to question one another. Look through research they did and analyse data using real-life data instead of textbook materials. More inquiry and building on one another's answers. In class they are speaking out more. The rest look forward to doing something in class. Not sure how much they learn but having more fun now.")*

Conclusion

Through the out-of class and in-class activities, students' responses were found to be more scientifically coherent with better elaborated explanations. This shows that students were better engaged and more motivated as the Flipped Classroom Strategy proves to be a promising strategy to bridge the learning between out-of class and in-class learning. It encourages students to apply their learning experiences in class as evident in the results analysis.

Citations

[1] Lemmer, C. (2013). A view from the flip side: using the "inverted classroom" to enhance the legal information literacy of the international LL.M. student. Law Library Journal, 105(4), 461-491
[2] Brunsell, E., & Horejsi, M. (2011). “Flipping” your classroom. Learning and Leading with Technology, 78(2), 10.
[3] Chin, C., & Osborne, J. (2008). Students' questions: A potential resource for teaching and learning science. Studies in Science Education, 1-39.