Learning Through Filming (LTF)
A Pedagogical Strategy for the Teaching and Learning of Engineering Procedural Knowledge

May 2018
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**Context of Teaching Procedural Knowledge**

Procedural knowledge, which refers to how we do or make something (Schraw, 2006), is a typical learning outcome for engineering students and generally in TVET. The teaching of procedural knowledge involves the internalisation of steps and processes involved in completing a combination of tasks. These steps are often not easy to visualize or explained.

For a long time, there has been a lack of pedagogic strategies to support students’ learning of procedural knowledge (McCormick, 1997) and teachers often spend considerable time explaining concepts and demonstrating procedural steps repeatedly. This repetitive teaching strategy may cause students to become impatient and bored.

**Challenge of Teaching 21st Century Students**

Students of the 21st century are digital natives who prefer experiential, exploratory, practical, results-oriented and collaborative learning. They are often not receptive to repetitive learning or instruction, preferring more exciting, hands-on projects that involve all senses.

As teachers also face constraints in curriculum hours and insufficient training equipment in the lab or workshop, what pedagogical solution can be employed to enable teachers to help TVET students retain the practical skills and knowledge required of the engineering tasks and procedures?

**Learning through Filming Teaching Strategy and Its Objectives**

The School of Engineering of ITE College West in Singapore advocates the LTF Teaching Strategy as a pedagogical solution:

- to enhance retention of knowledge for the teaching and learning of procedural-based content
- to engage students in learning using technology

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<thead>
<tr>
<th>Implementing Institution(s):</th>
<th>Institute of Technical Education, Singapore</th>
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<tbody>
<tr>
<td>Region(s) of Implementation:</td>
<td>ITE College West, School of Engineering (SOE)</td>
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<td>Timeline:</td>
<td>Trial Implementation: 2014 to 2015</td>
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<td>Full implementation: 2016 to date (on-going)</td>
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<td>Beneficiaries:</td>
<td>Annually about 2800 students from ITE College West, School of Engineering</td>
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<tr>
<td>Total cost incurred/ resources required:</td>
<td>1. Hardware*: Tablets/Smart phone and PCs/Laptops (using existing tablets/smart phones of students and PCs/Laptops from School or students)</td>
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<td></td>
<td>2. Software: Free software (eg: Microsoft Windows Movie Maker, and Panzoid Clipmaker)</td>
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*For schools that would like to purchase tablets or PCs, the ratio of 4 students to 1 device is recommended.

- to improve technical English and presentation skills
- to improve interpersonal skills and teamwork among students
- to strengthen students’ sense of accomplishment and motivation

The faculty has adopted LTF teaching strategy in conducting practical lessons for courses in automotive engineering, electrical engineering, facility management, mechanical engineering, mechatronics engineering, rapid transit engineering, automotive technology (heavy and light vehicles), electrical technology (lighting & sound, power & control), facility technology (air conditioning & refrigeration, mechanical & electrical services), mechanical technology, mechatronics and rapid transit technology.

LTF requires students to produce instructional videos in groups using available devices such as mobile phones, tablets or video cameras. The process involves scripting, filming, annotating, editing, presenting and reviewing of the video.
Implementation of LTF

The LTF process is supervised by two lecturers, who guide the students using ITE Pedagogical Model (P.E.P.P.E.R.). Illustration of the steps and phases of implementation are as follows:

The idea is to ‘Teach Less Learn More’.

**Roles of Teachers**

1. Lecturers develop the ‘Learners Engagement Plan’ for the lesson delivery.
2. Lecturers group students into 4 to 5 students per team to collaboratively produce the instructional earning videos. (Tip: to have a mix of VARK learners so that students can perform the roles that best suited their learning abilities).
3. Lecturers conduct practical lessons (at respective workshops / labs) for students to acquire the key competencies required for the topic.
4. Prior to the video production, lecturers train students on the use of video editing tools, and iDe’Lite to include video annotation.

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**ITE Pedagogic Model**

- **PERFORM**
  - Demonstrate mastery of learning
  - Gain mastery of learning

- **PRACTISE**
  - Use various ways to learn

- **EXPLOR**
  - Identify what need to be learnt
  - Use various ways to learn

- **PLAN**
  - 60 – 70% Technical Competencies
  - 10-20% Personal & Sociological Competencies
  - 10-20% Methodological Competencies

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**Students filming for the video**

**Students editing the video**

**Students presenting the video in class**

**Lecturer review procedures in video**
5. Lecturers facilitate the LTF project (ranging between 4 to 6 weeks).

6. At the end of the project, lecturers together with Section Head and/or Course Manager review & critique the learning videos (during students’ presentation).

7. The lecturers judge the top 3 teams and upload the best videos onto ITE’s iDe’Lite Portal. (iDe’Lite Portal is a customised video repository and internal video hosting system used to manage and stream training videos created by any staff within ITE for all 3 colleges. It has a unique annotation feature that allows multiple annotation and segmentation of videos into smaller sections).

8. The video links are then embedded in the module learning plans within ITE’s MyConnexion Learning Management System.

Roles of Students

1. Students plan the project to define key deliverables, distribute workload and set project timeline.

2. Typically, each project is given 4 weeks to complete, and students have the flexibility of allocating time for each task they need to do.

3. Prior to the filming process, students learn the actual procedure (explore) of the content at the respective workshops / labs.

4. Thereafter, students proceed to practise their understanding through filming. The process involves script writing, filming, annotation of the clips, and editing the video. *(only the filming of the procedural tasks need to be done in the respective workshops / labs, the rest of the task can be done at any venue of their choice (i.e., classrooms, library, computer lab, or even at home)*

5. Students “enquire and reflect” at every phase of the project, thus deepening their knowledge of the procedural content.

6. Once the video is completed, students present (perform) the instructional video to the class.

Innovative Solution for Teaching Engineering Procedural Knowledge to 21st century Students

The LTF teaching strategy addresses the challenges of teaching 21st century students’ procedural knowledge where:

- The digital natives are given the opportunity to use tablets or smartphones to learn.
- Students work collaboratively (in groups of 4-5) to produce an instructional video.
- A mini competition is organized to identify 3 best videos, which aims to ‘challenge’ the results-oriented students.
- The experiential and exploratory learning in scripting, filming, annotating, editing, presenting and reviewing the produced video replaces the teacher-centred repetitive instruction.
- Students can learn anywhere and anytime as they produce the instructional videos.
- This is a creative solution to encourage student-centred learning while deepening their learning of
procedural-based content knowledge.

- Students are empowered to take charge of their own learning.

Impact of Implementation

Surveys conducted before and after the implementation has shown LTF teaching strategy to be engaging and effective. More than 90% of the students report enhanced learning and better retention of skills and knowledge for the LTF’s trial run, implemented for Nitec in Facility Technology students (2014-2015).

After the first stage of mass implementation (Jan-June 2016) to 10 classes in School of Engineering (about 360 students), results also showed that 95.8% of students gained greater confidence in performing the procedural-based task after LTF and 89% acknowledged the usefulness of LTF.

The team shared some key success factors for LTF implementation. This relates to formation of a Pedagogic Innovation Team at the School of Engineering (ITE College West) which is chaired by a Deputy Director of School, supported by a School Lead Mentor, with departments’ mentors and key staff as members.

The team meets quarterly to discuss problems that teaching staff face in their teaching and solutions to facilitate students’ learning. A Project Lead is appointed to lead the project with the support of team members.

Just-in-time training was provided in November 2015 for appointed Lead Agents to kick-start LTF teaching strategy in January 2016. 2-4 Lead Agents (appointed from mentors and key staff from each department) were trained, and then partnered with new staff to implement LTF, creating a multiplier effect.

Lessons Learnt and Future Outlook

LTF teaching strategy has addressed the challenges raised by the lecturers in teaching procedural-based content. It also helped to address the learning needs of 21st century engineering students.

This custom-designed teaching strategy, integrating ITE’s pedagogic model P.E.P.P.E.R. has been successfully implemented in ITE College West School of Engineering and is recommended to be adopted by any TVET education institutions for teaching procedural-based content.

Some concerns to note are that higher level of support should be given to students at the script-writing stage as the engineering students were generally found to be weak in writing skills. This could be provided through teaching notes or encouraging use of apps (eg: Grammarly) to help students with grammar and spelling.

Also, the LTF teaching strategy should be balanced with constant practice of using the equipment or machine for better impact.

The School of Engineering of ITE College West hopes that the LTF teaching strategy could benefit some 12,000 students annually across the three ITE Colleges in Singapore, further on to be replicated in other regions.

Conclusion

This case study showcased the implementation contexts of LTF teaching strategy that successfully facilitated engineering students’ grasp of procedural-based content knowledge and also personal and social skills.

To ensure a successful implementation of LTF teaching strategy, it is recommended that TVET education institutions build a team of lecturers who believe in pedagogical innovations and are dedicated to implement the phases in individual lessons. A supportive management team to allocate resources where needed, to provide consultation and to organize just-in-time training is also crucial.

References


Further information

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“Good Practices” are chosen according to selection criteria that have been created by a working group. They aim to serve as benchmarks for transformation towards quality TVET. However, they reflect on the individual circumstances of the submitting country and may only be adopted with context specific modifications.

Visit our website to learn more on our website at:

www.sea-vet.net/tvet-in-southeast-asia/good-practices

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