

Enhancing Academic English (AE) For Broad Spectrum Communication Competencies in STEM Universities

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CONSTRUCTIVISM

(Experiential learning)

構成主義 (教育)

Can we put a theory of education into a single word? Our experimental series is attempting to work with a required Academic English class to promote “knowledge creation.”

Here's the problem.

The Professor of Electrical/Electronic Engineering has to teach Academic English to 110 third year engineering students in Japan. It's in his contract.

I have been teaching 40 years in Japan. In 2016, I took a chance to volunteer as a consultant, to try again to successfully teach English to a large number of students.

The Experiment Series

- 2017: Poster Presentations. The FLIPPED CLASS ROOM.
- 2018: Poster Presentations. The Flipped Side of Academic English Class.
- 2019: Poster Presentations: Task-Based Learning (TBL) VS Project-Based Language Learning (TBLL).

A Reminder for an Idealist

- “Gentlemen, never forget that when you enter your classrooms for the first time tomorrow you may very well find yourself **in the presence of your intellectual superiors.**”
- Allan Vaderhoef Heeley, Headmaster, “Fathers and Teachers,” *THE YELLOW LEAVES*, p.55

And I remind myself that:
“The only way to do great work
is to love what you do.”

Steve Jobs

After the 2016 class of “standard”
strategies.

We did “something new.”

“Engineering
the Academic English Classroom
for the
Knowledge-Creation Mind-set”

PROPOSITION

Japanese students are good at **Self-Regulated Learning (SRL)**

→They can set goals and evaluate solutions by themselves

SRL: Memorize words and grammar; pass written exams.

→Problem: They are not good at **studying English**

English Competence:

Conversation practice, speaking, listening, and interacting with others.

It takes real time, so it's difficult to see the progress.

Our Proposed Study

We made poster presentations with teams. (“workshop” style)

Divide +/- 110 students into 2 groups:

Control Group

Two teachers
Make groups of 3 or 4

Test group

Two teachers
Make groups of 3 or 4
Teaching Assistant
Leader or Representative
Visitors from outside
Specific PBL instructions

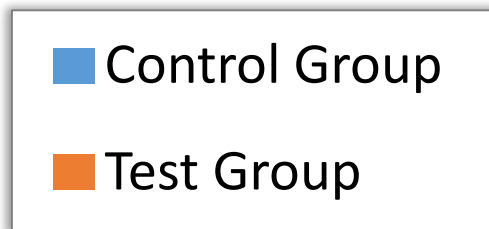
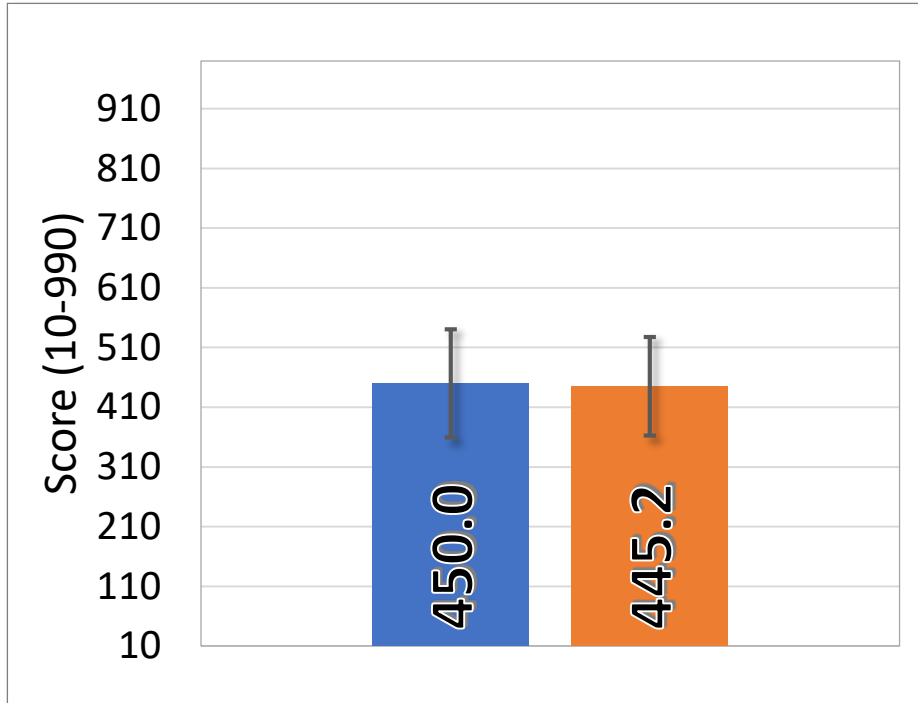
Evaluate the results with section quizzes and a final exam.

Here are results of 2018 experiment.

After we show results,
we talk about how and why we got these results,
so that we can refine the procedure
in the third iteration of the experiment project.

TOEIC

(Latest TOEIC score; 10-990 possible range)



t-Test: Two-Sample

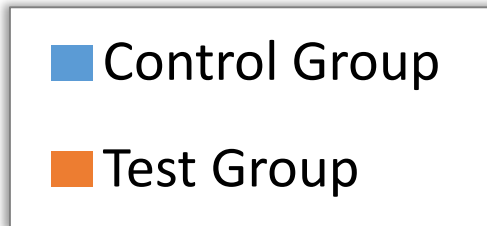
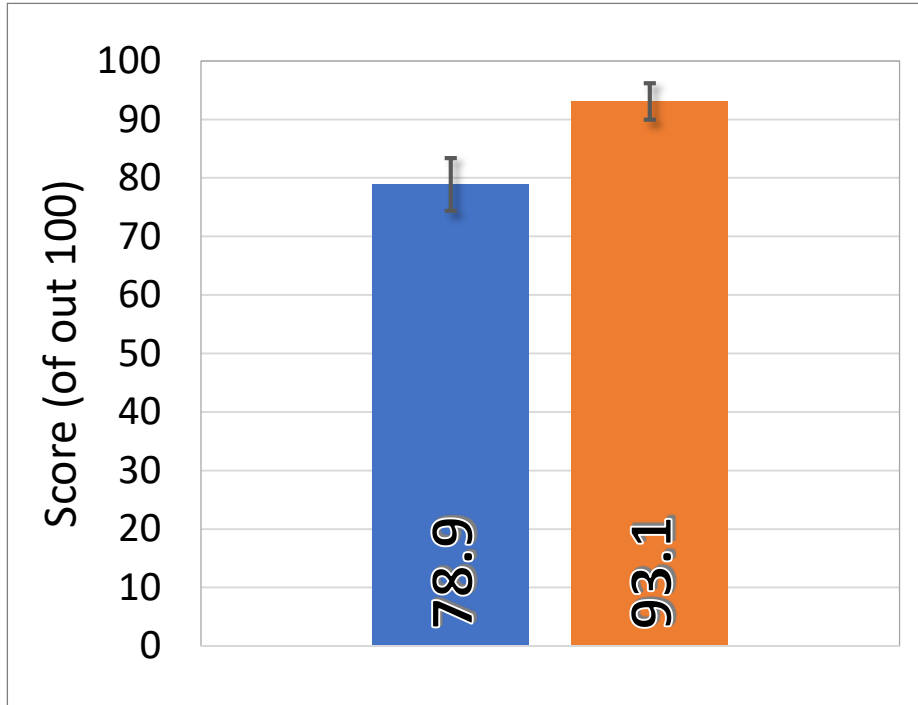
(Assuming Unequal Variances)

| | Control | Test |
|--|----------------|--------------|
| Mean | 450.0 | 445.2 |
| Standard Dev. | 90.6 | 82.5 |
| Observations | 52 | 52 |
| Deg. Freedom | 101 | |
| <i>t</i> stat | 0.283 | |
| <i>p</i> ($T \leq t$) one-tail | 0.3889 | |
| <i>t</i> critical one-tail | 1.660 | |
| <i>p</i> ($T \leq t$) two-tail | 0.7778 | |
| <i>t</i> critical two-tail | 1.983 | |

(Error bars denote 95% confidence intervals.)

Participation

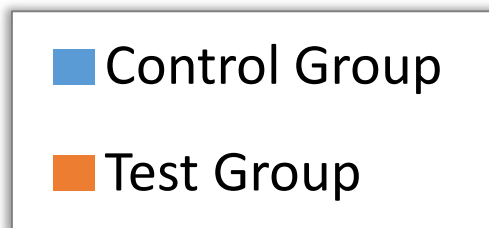
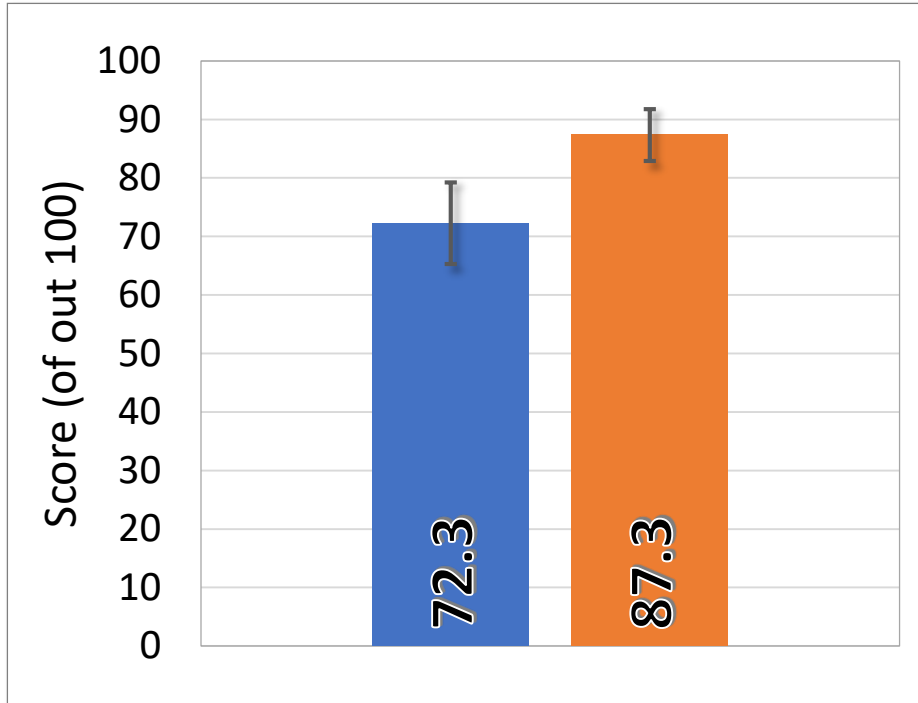
(Attendance and Judging Posters)



| <i>t-Test: Two-Sample</i> (Assuming Unequal Variances) | | |
|--|-----------------|-------------|
| | Control | Test |
| Mean | 78.9 | 93.1 |
| Standard Dev. | 16.4 | 11.5 |
| Observations | 53 | 54 |
| Deg. Freedom | 93 | |
| <i>t</i> stat | -5.166 | |
| <i>p</i> (T<=t) one-tail | 6.77E-07 | << 0.01 |
| <i>t</i> critical one-tail | 1.661 | |
| <i>p</i> (T<=t) two-tail | 1.35E-06 | << 0.01 |
| <i>t</i> critical two-tail | 1.985 | |

(Error bars denote 95% confidence intervals.)

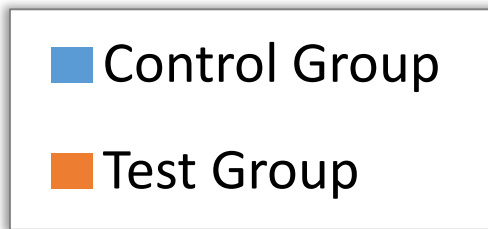
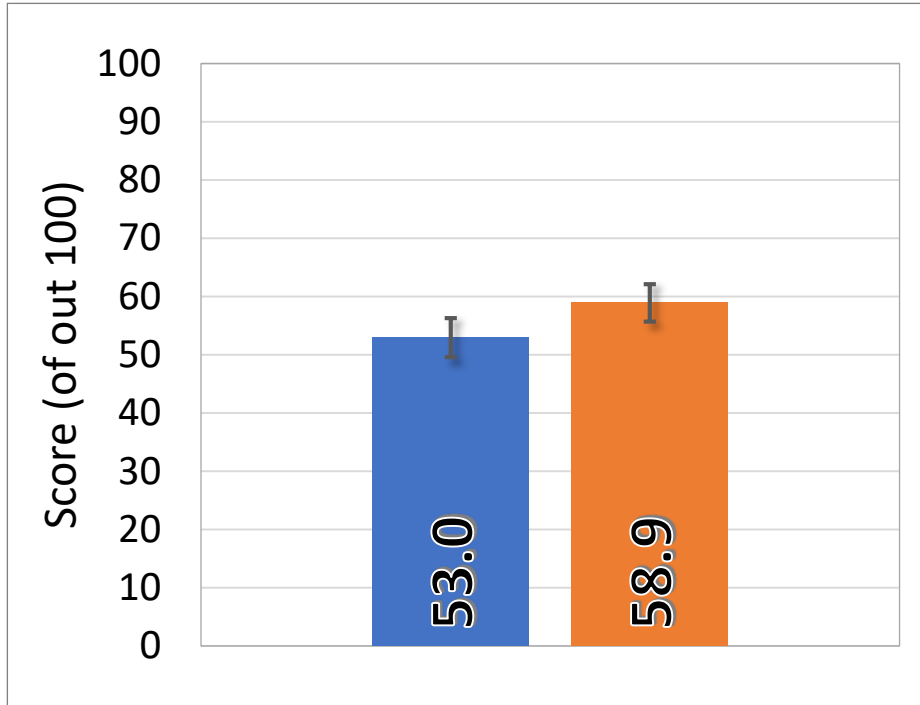
Quizzes



| <i>t-Test: Two-Sample</i> <i>(Assuming Unequal Variances)</i> | | |
|---|----------------|-------------|
| | Control | Test |
| Mean | 72.3 | 87.3 |
| Standard Dev. | 25.3 | 16.3 |
| Observations | 53 | 54 |
| Deg. Freedom | 88 | |
| <i>t</i> stat | -3.649 | |
| <i>p</i> (<i>T</i>≤<i>t</i>) one-tail | 0.0002 | << 0.01 |
| <i>t</i> critical one-tail | 1.662 | |
| <i>p</i> (<i>T</i>≤<i>t</i>) two-tail | 0.0004 | << 0.01 |
| <i>t</i> critical two-tail | 1.987 | |

(Error bars denote 95% confidence intervals.)

Final Exam



| <i>t-Test: Two-Sample</i> <i>(Assuming Unequal Variances)</i> | | |
|---|----------------|-------------|
| | Control | Test |
| Mean | 53.0 | 58.9 |
| Standard Dev. | 12.2 | 11.8 |
| Observations | 53 | 54 |
| Deg. Freedom | 105 | |
| <i>t</i> stat | -2.566 | |
| <i>p</i> (<i>T</i>≤<i>t</i>) one-tail | 0.0058 | << 0.01 |
| <i>t</i> critical one-tail | 1.659 | |
| <i>p</i> (<i>T</i>≤<i>t</i>) two-tail | 0.0117 | << 0.02 |
| <i>t</i> critical two-tail | 1.982 | |

(Error bars denote 95% confidence intervals.)

DISCUSSION (PBL)

TO SET UP WHOLE EXPERIMENT

English Class set-up for the experimental environment.
Required for graduation:

We need:

Control Group C

Experimental group E

Initial level of English

Consistency

Punctuation (sections)

Definable differences

between C and E.

Flipped Classroom:

It's a Workshop

A laboratory

Assigned groups

We assume homework

Utilize MOODLE

Online support platform:

(Still learning!)

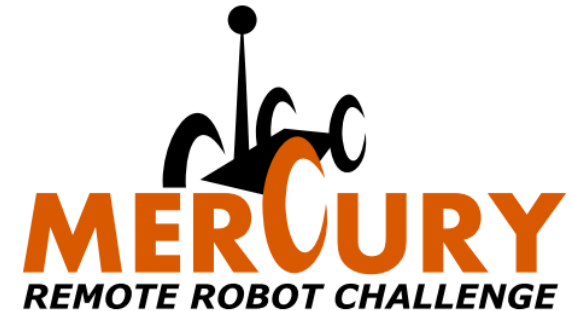
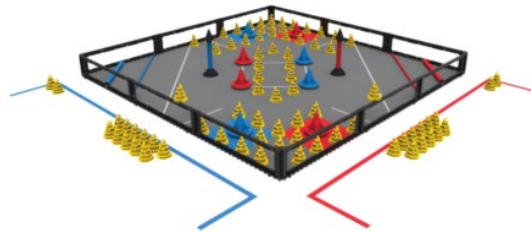


Class #3
Grand Theme
and Session #1 Theme



This Semester's Grand Theme

今学期の全体テーマ



https://en.wikipedia.org/wiki/Robot_competition

<https://www.robotevents.com>

<https://www.roborave.org/challenges>

<https://mercury.okstate.edudf>

Mini Poster
Presentations!

Class Days 1-15

1 First
Class

2 Make
Teams

**Final
Assessment!**

15 😞

3

6

9

12

4

7

10

13

5

8

11

14

**Session 1
Competition
Overview**

**Session 2
Hardware**

**Session 3
Software**

**Session 4
Special
Features**

EXPERIMENT(実験) (KNOWLEDGE CREATING CLASSROOM)

Poster presentation

(All EE students in teams with leaders.)

Group: Which leader? Boss or Rep?

Research Assistant

(Senior student advisor)

Middle-up-down management

Teacher \leftrightarrow TA \leftrightarrow Students

More creative and innovative than bottom up or top down management

Audience:

Expert retired

Businessmen.

Preparation for working in society, like in companies. Mixed community.

The Statistics

Slide 10: Establish sufficient English ability

Slide 11: Participation

Slide 12: Quizzes

Slide 13: Final Exam

So then we ask questions.

Why not make the Control Group a standard SRL class?
We discussed with Professor Chandler. His answer: No way!

How did we measure participation?
Can we do it better?

How did we create and administer quizzes?
How can we do it better?

How did you do the Final Exam?
How can you refine it?

This is the active part of the SECI spiral.

Engineer: Teacher

My job: Consultant

Professor sets class agenda Academic English.

Wilkinson sets frame for whole person learning, interpersonal and team learning.

Spiral with recursive loops. Ascension.

Growth Processes are developmental.

They advance, proceed, grow, emerge.

They develop, evolve, and create.

I would like to thank Dean Nishihara
(西原純・元学部長) for sharing a ground-
breaking reference.

Professor Nishihara

Introduced me to:

The Knowledge Creating Company

Ikujiro Nonaka and Hirotaka Takeuchi (1995)

知識創造企業

Middle-up-down management and the SECI model

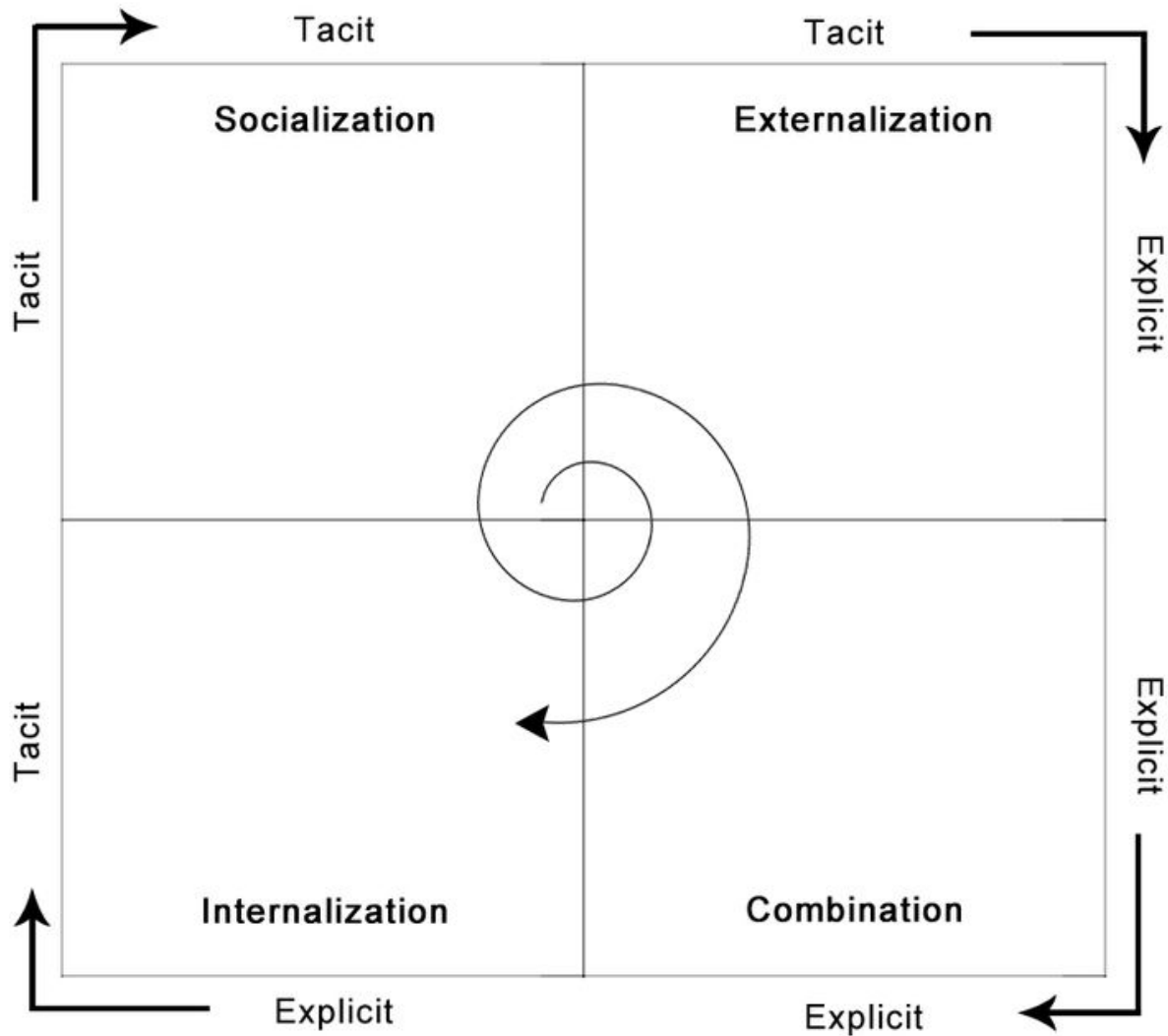
The Knowledge Creating Classroom

PBL and Poster Presentations about
Electrical and Electronic Engineering
are the primary structure of the flipped class.

Then, what is special about
The Knowledge Creating Classroom?

This is the active part of the SECI spiral.
CONSTRUCTIVISM

S.E.C.I Model

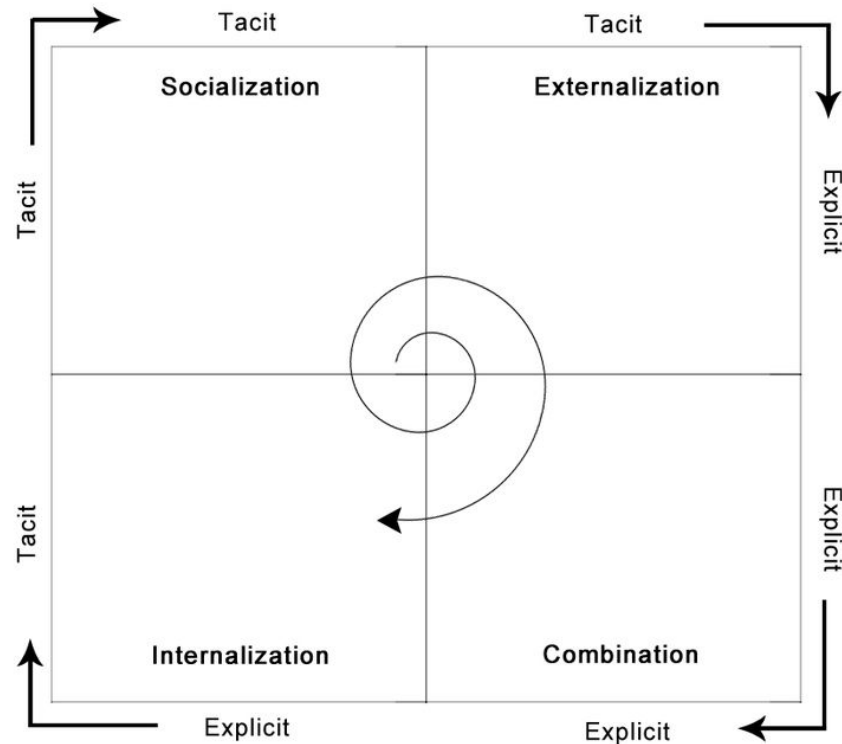


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THE SECI MODEL APPLIED Faculty of Engineering

1st year:
General
Education
Requirements
Intro. Classes
Clubs

4th year:
Select or
be placed
In a lab.



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2nd year:
Continue:
教養科目
専門科目

3rd year:
Survey
major field
choices.

The University and Hamamatsu provide requisite variety
For developing students. (“Requisite Variety” Ross Ashby)

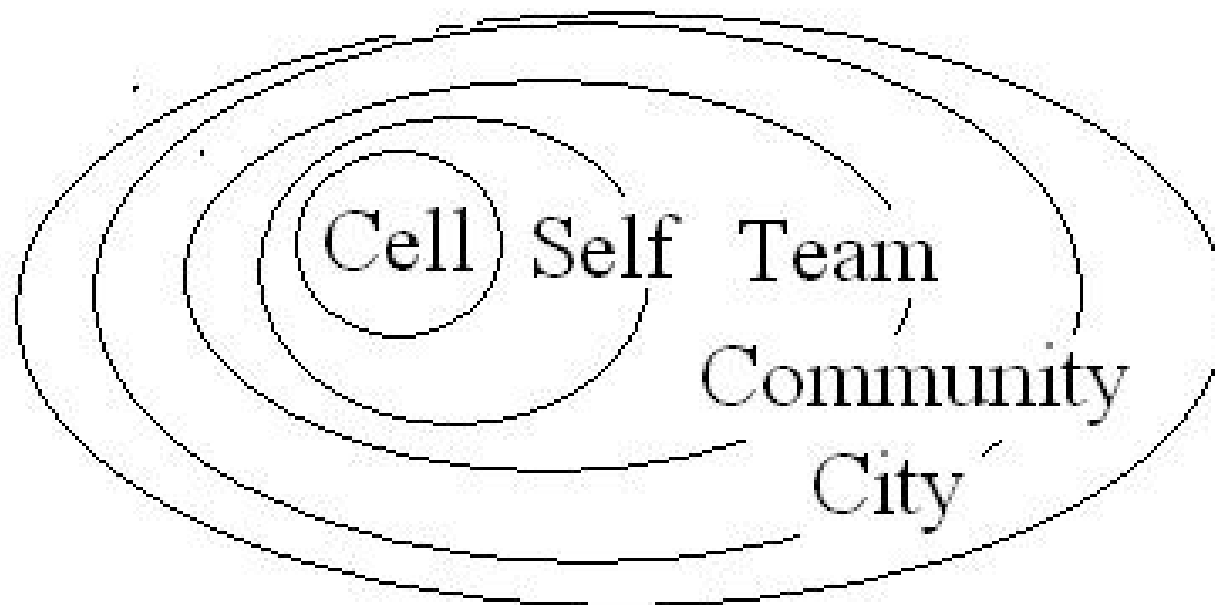
S.E.C.I. Pattern is an ENERGETIC STRUCTURE

$$V = 2\pi^2 R r^2$$

Torus



Nested Organismic Life



The S.E.C.I. Cycle characterizes living systems.
Each cycle is torus, influence each other and develops.

The Cybernetics of Development

- They are active elements of torus

The Self

自分

Integrity

The TEAM

Organize

Leadership

Support Management

GOAL

The Community

(The Neighborhood

The University):

Sustainable, resilient

Development

*Cybernetics: Or Control and Communication
in the Animal and the Machine.* (1948)

The Human Use of Human Beings. (1950)

Norbert Weiner

SELF and COMMUNITY Development



Maslow's Needs Hierarchy

KNOWLEDGE CREATING University

TOP-DOWN
MANAGEMENT

Hierarchy

Executive:

President

Faculty

Department

LABS

ADMINISTRATION:

SUPPORT:

Promotion

Assignments

BOTTOM-UP
MANAGEMENT

Elections Voting Representation

Voluntary Participation

MIDDLE-UP-DOWN

The Laboratories

More creative and innovative than bottom up
or top down management

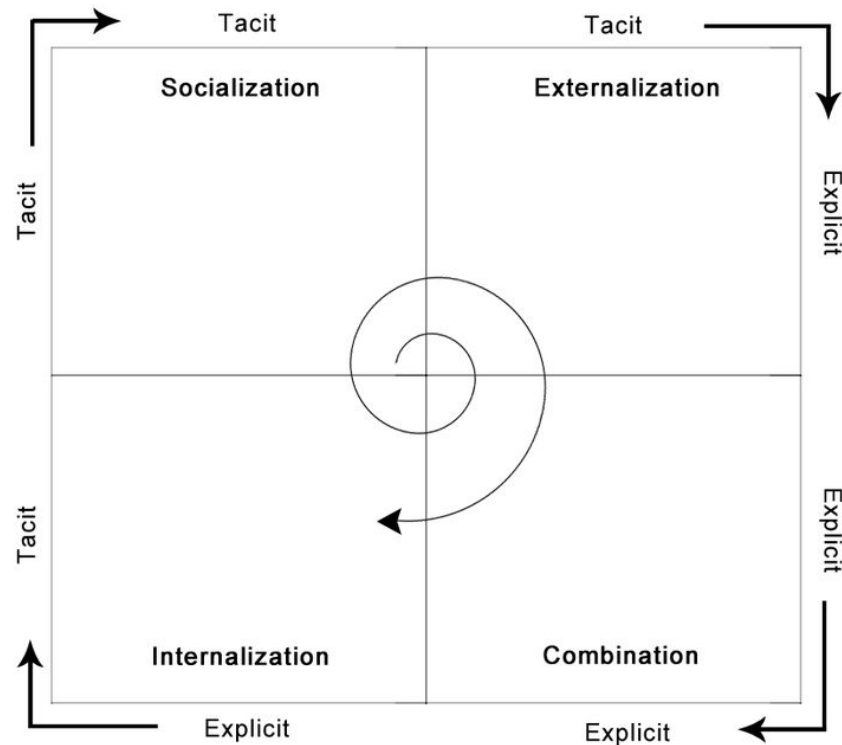
The E TEAM in Academic English:

- Group Dynamics (Tuckman)
- Situated Learning (Lave/Wenger)
- Cooperative Principle (Grice)
- The Engineering Professor has "know-how." Qualitative attribute of "tacit learning." (*The Tacit Dimension*, 1967. (Michael Polanyi))

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1st year:
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BUT WHAT ABOUT THE CONTROL GROUP?

The question about the Control Group lead to Prof. insistence that C not suffer a poorer educational environment. The Difference between 2016 and 2017 perfectly convinced us of the superiority of the workshop.

So how do we give good value?

TASK BASED LANGUAGE LEARNING (TBLL)

- In 2019 we will utilize MOODLE with the assistance of a technical assistant.
- After introducing MOODLE on Day One, in C and E, we leave E class to organized energetic development.
- C class will prepare their presentations in teams with attempts to inculcate the organizational ideas consciously, as concepts put into words.
- We'll do our best to inspire the C class to higher learning. Maybe we will succeed!