

今なぜSoTLなのか： 日本の大学における可能性と課題

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1

アウトライン

- Scholarship of Teaching and Learningの源流
- アメリカにおけるカーネギー財団CASTLプログラム・知識メディア研究所の取組（1998～2008）
- MITにおけるSoTL的展開（2009～2011）
- 日本におけるSoTL的取組の事例（京都大学高等教育研究開発推進センターによる国内大学教員のためのMOSTフェローシッププログラム, 2012～現在）
- 今後の日本の大学におけるSoTLの可能性と課題

2

アメリカの高等教育におけるFDの歴史

- 元来は、研究者としての専門知識の育成に主眼
 - 「研究分野を熟知している＝よく教えられる」という前提に基づく
 - 研究休暇制度（Harvardで1810年に始まる）
- 社会や経済における変化の影響（例：1960-70年代の学生運動や石油ショックによる不況）
 - 既存の講義スタイル、研究・知識偏重主義への批判
 - 学生の多様化（年齢、人種、文化、社会経済的階層、社会人の就学など）
- 大学教員の雇用形態の変化（「無制限」な雇い入れの終焉、終身雇用制度の導入）

3

アメリカの高等教育におけるFDの歴史（続）

- 1960代の終わりには、アメリカの高等教育におけるFDプログラムの数は、50未満。
- 専任のコーディネーター・ディレクターを置くFDプログラムが設置された大学（短大を除く）は、1970年半ばには40%+、1990年半ばには約70%に増加。
- 1990年代の主流は、FDプログラムの改善やTeachingの質的向上。
 - 教育奨励賞の改善や学部・学科長の積極的関与。
- 2000年代の主流は、Learningの質的向上。
 - 教授・学習ポートフォリオなどの導入。「学習の証拠」をどのように収集し、教育改善に役立てるか。

4

1990～2000年代のFD改善・拡充の主眼

- 新任教員の育成と保持
- 多様な文化・人種への配慮
- 学部・学科長のリーダーシップとサポート
- ティーチング・アシスタントの養成
- 教育の質的評価
- 包括的なFD
- テクノロジー利用による遠隔教育
- 非常勤教員の養成
- カリキュラム開発（テクノロジー・インターネット活用も含む）

5

過去20年余りにおけるFDのもう一つの潮流： Scholarship of Teaching and Learning (SoTL)

- 教授実践を公開する (making teaching public)
- Peer Reviewを通じた建設的意見交換を行う
- 互いの実践から学び合い、個人・コミュニティとして教育実践の改善に関する知識構築を行う

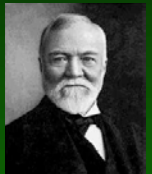


(Lee S. Shulman)

6

カーネギー教育振興財団について

- 教育の進展に関する学術調査や政策研究を行う研究財団（独立法人シンクタンク）
- 1905年設立
- 初等・中等・高等教育、専門家教育の改善と進展に関する13のプログラム・プロジェクト
- プログラムを通じた助成活動



7

Faculty Developmentとは、
大学における「教授実践」の
文化や価値観を変えること。

個々の教員の価値観・教授活動に対する
意識と行動の変容

教授実践コミュニティの形成

教育機関としての大学の意欲的な取り組み

8

教育実践コミュニティの特性と価値観

実践	Good	Better	Best
コミュニティの特性	Communal 共有的	Collaborative 協調的	Competitive 競争的
価値	Product 現状	Process 改善の過程	Product 理想的モデル

Carnegie Academy for the Scholarship of Teaching and Learning (CASTL)

Scholarship of Teaching and Learningリーダー養成のための一年制のフェロシッププログラム (1998-2008)



CASTL: 学際的コミュニティ

生化学	法学
ビジネス	数学
化学	芸術学
コミュニケーション	哲学
経済学	物理学
教育学	政治学
工学	心理学
文学	宗教学
語学	社会学
歴史学	神学
複合領域分野	公衆衛生学

THE CARNEGIE FOUNDATION for the ADVANCEMENT of TEACHING

WORKSPACE

MyWorkspace | CASTL HE | KML

2003 Scholars

Whitney Schlegel Indiana University School of Medicine Medical Sciences 300 Jordan Hall, Bloomington, IN 47405 Email: wsclegel@indiana.edu Phone: (812) 855-7116 Discipline: Health Sciences	Resource Bin	Introductory Snapshot Proposal Snapshot Initial Project Snapshot January Project Snapshot Final Project Snapshot
Jeffrey Sommers Miami University-Middletown English Miami University, Department of English Middletown, OH 45140 Email: sommersj@dmuohio.edu Phone: 513 727-3260 Discipline: English	Resource Bin	Introductory Snapshot Proposal Snapshot Initial Project Snapshot January Project Snapshot Final Project Snapshot
Kathy Takayama University of New South Wales Biotechnology and Biomolecular Sciences UNSW School of Biotechnology and Biomolecular Sciences, Microbiology and Immunology	Resource Bin	Introductory Snapshot Proposal Snapshot Initial Project Snapshot January Project Snapshot

知識メディア研究所

Knowledge Media Laboratory (KML)

- マルチメディアやネットワークテクノロジーを利用した教育の質的改善に関する調査・研究・開発
- より多くの教員・学習者・教育機関が、「教授・学習に関する内在的経験や知識を外在化し、知の実践コミュニティとして共有・蓄積可能にする」ための支援・提言
- 教育におけるこのようなテクノロジー利用を促進するための啓蒙・普及活動と将来ビジョンの探求

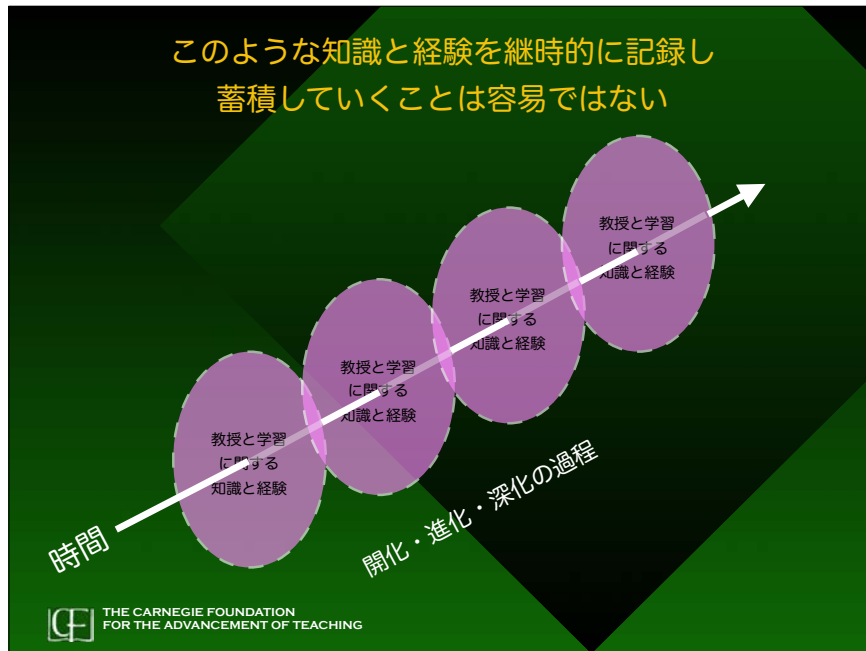


各CASTLフェローのプロジェクトとそこから得られた知見をマルチメディアとインターネットを利用して、どのように公開し共有できるか？

教育的知識や経験をどのように扱い、
どのように表象すればいいのか？

ここでいう「知識(ナレッジ)」とは？

教授と学習に関する
経験的知識



17

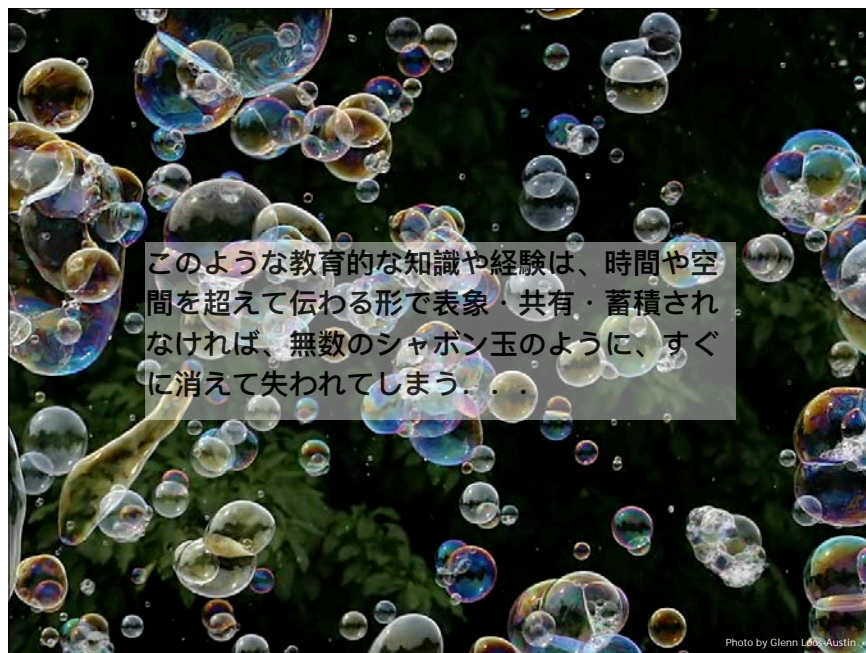
教えに関する3種類の知識

- Pedagogical Knowledge (教え方に関する知識)
- Content Knowledge (教科・専門分野の内容に関する知識)
- Pedagogical Content Knowledge (特定の内容を効果的に教えるための知識)

(Lee S. Shulman)

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18



19



20

Project Reports, Student Examples, Assessment Data

教授や学習に関する物証 (objects) を 吟味・検証・選択・整理し、マルチメディアを利用した簡潔で明解な「知識表象」として精練するのは、時間的・技術的・知的に大変なプロセス。

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複雑な授業改善プロジェクトをウェブで表象しようと試みたが...

Group Answers To: Why Does Reciprocal Teaching Improve Students' Understanding

November 19, 1998

Group 3, Group 4, Group 5

Course Overview, Middle School Science Problem, Reciprocal Teaching Problem, Flawed Thinking Problem, Two Students Problem, Group Learning Problem, Final Project: Teaching for Understanding, Course Summary

Analysis of student performance: In reviewing the students' written responses to their case study analyses for the Two Students Problem, my primary concern was to determine whether students could develop plausible answers based on relevant disciplinary concepts. Consequently, I made holistic judgments based on whether an answer provided a plausible, warranted explanation to the question, and whether it incorporated relevant disciplinary concepts from the course. A more fine grained analysis could focus on additional dimensions of the answers such as their coherence, completeness, overall accuracy, etc. However, I used this case to determine whether students could use newly learned concepts to analyze a new problem, and was not concerned with kind of detail or formal aspects of writing.

Student contains questions used in aspects of

Course Overview, Middle School Science, Reciprocal Teaching, Flawed Thinking, Two Students Problem, Group Learning, Teaching for Understanding, Course Summary

Analysis, Flawed Thinking Analysis, Two Students Analysis, Group Learning Analysis, TPU Analysis

Elect someone to record the group's answer and hand it in at the end of class. Write your group's answers on newsprint and be ready as a group to explain your answers to the class.

Cerbin(1999)

-Frankenstein of MMP
-“Blair Witch Project”
-“Hotel California”

cerbin@mail.law.iast.edu

The Development of Student Understanding in a Problem-Based Educational Psychology Course

Introduction

Research indicates that deep understanding of a subject is not an automatic consequence of teaching or of students' efforts to learn. In *The Unschooling Mind*, Howard Gardner concludes that

“...an ordinary degree of understanding is routinely missing in many, if not most students. It is reasonable to expect a college student to be able to apply in a new context a law of physics, or a proof in geometry, or a concept in history of which the just demonstrated mastery in her class. If when the circumstances of testing are slightly altered, the sought-after competence can no longer be demonstrated, then understanding in any reasonable sense of the term has simply not been achieved.” (1991, p.6)

In my classes students' understanding of important disciplinary concepts tends to be superficial and undeveloped (cf. *Course Portfolio*, Cerbin, 1992). Moreover, students have difficulty applying disciplinary knowledge beyond the contexts in which it is learned. And, even when

Reciprocal Teaching Problem

Reciprocal Teaching Analysis

抜本的方向転換と躍進!

“Mini” Cerbin (2001)

Revealing Student Understanding in a Problem-Based Educational Psychology Course

William A. Cerbin, University of Missouri - 14 Class with the Knowledge Media Lab of the Carnegie Foundation

Expanded Course Portfolio • Syllabi • Audio Reflection (mp3, 2, 2002)

In order to promote students' understanding of basic concepts related to learning and teaching, I adopted a problem-based learning (PBL) approach in the educational psychology course. The course is organized around **case problems**. In the second problem, I ask students to register any required teaching (RT), an approach to teaching reading comprehension, which, in theory, the students have all the knowledge they need to understand why it works, but in practice realize they can't develop an effective model of it. The reciprocal teaching exercise tests students' ability to register any RT problem, reading comprehension in questioning, clarifying, summarizing, predicting lead to comprehension. To facilitate their understanding, I conduct the class in four parts. Click on each section below to see how this class session promotes student understanding.

Summary of student performance. I have used the RT exercise in both PBL and non-PBL classes. Overall, the results are encouraging. In effect, the PBL students were better able than the non-PBL students to transfer relevant concepts to the new problem (cf. Cerbin, 2002). Interestingly, students' abstraction of something from one context and application in a new context (Cerbin and Herbin, 1999). PBL students used relevant disciplinary concepts and established plausible connections to register why RT promotes comprehension. Non-PBL students failed to make causal connections, and also appeared to receive benefits from the RT experience. www.law.missouri.edu/~cerbin/

- Introductory history
- Case with a twist: how to avoid 1 problem on a session of Reciprocal Teaching. The purpose of the history is simply to facilitate the RT exercise and ensure discipline-related questions.
- writing activity
- writing activity: students are asked to register any RT problem, reading comprehension in questioning, clarifying, summarizing, predicting lead to comprehension. In addition they are asked to register any RT problem.
- small group work
- students work in small groups to develop a set of "best"
- class discussion
- I give students a chance to discuss and articulate their own views on the RT exercise and its application to the RT problem. The final discussion is an opportunity to make a summary of the RT exercise and its application to the RT problem.

Cerbin(1999)

そして進化は続く...

「三拍子揃った」知識コミュニティの構築

はい！
やすい！
うまい！

...でなければ実現が難しい。

KEEP Toolkit: 教育知識表象・共有テクノロジー

The screenshot shows the KEEP Toolkit web interface. At the top, it says "KEEP toolkit" with the tagline "knowledge | exchange | exhibition | presentation". Below this is a navigation menu with "My Dashboard", "Choose a Template", "Home", "About", "Resources", and "Help". A status bar indicates "You are logged in" and "Log Out". The main content area is titled "Introduction to an Innovation in Our Department" and contains several sections for user input, such as "What is the issue we are trying to address?", "What is the change or innovation that is intended to address this issue?", and "What data or evidence will demonstrate the effect of our innovation?". A text editor window is open over the bottom part of the page.

オープンソース
無料利用サービス

2000年代当時のKEEP Toolkitネットワーク

- | | |
|---|----------------------------------|
| MIT | Kyoto University |
| University of Maryland | UCSF |
| University of British Columbia (Canada) | HHMI |
| University of New South Wales (Australia) | MERLOT |
| Aquinas College | University of Southern Maine |
| University of Minnesota | Virtual Teacher Centre |
| Gateway Community College | Queen's College |
| Thomas Jefferson University | Union Institute & University |
| North Carolina State University | Mills College |
| University of Wisconsin-Madison | University of Waterloo, and more |

教育改善に不可欠な教育的知識共有

「自らを絶え間なく進歩させる学術的実践コミュニティの一員としての大学教員の『職業的な責務』は、単に教育・研究内容や専門分野の知識を伝播すること以上のものでなければならない。これらを伝播するだけでは、教育の改善や改革を恒常的に促進させることは難しく、学術的実践コミュニティにとって、教授行為や教材・教育課程・教育的ツールの開発と利用に関する暗黙的・明示的知識を共有することは不可欠である。」

(Iiyoshi, Richardson, & McGrath, 2006; Iiyoshi, 2006)

オープンナレッジ支援ツール・環境の必要性

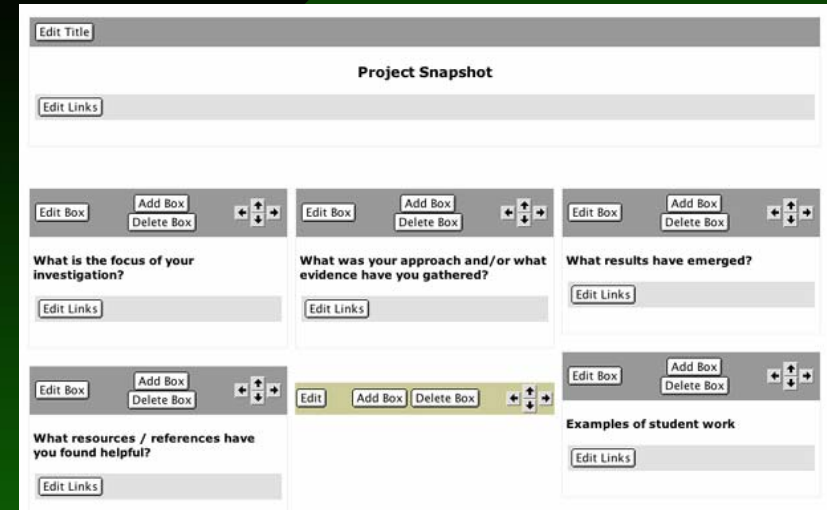
- 教授と学習の様々な側面を反映する物証（シラバス、教材、教授-学習過程における成果物など）の選定
- 分析と内省(reflection)を促進と支援
- 物証と内省を整理し、理解しやすい知識表象に精練
- 知識ベースを構築し、蓄積された知識を必要に応じて抽出し利用

教育的知識表象のフレームワークを テンプレートを通して提供



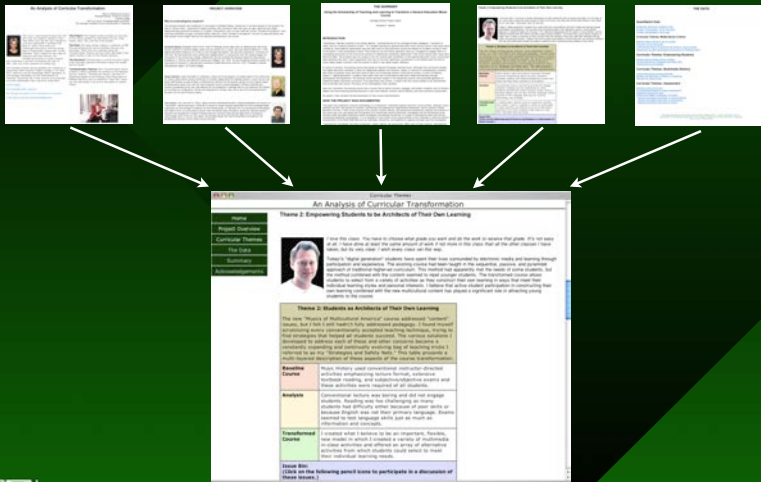
教授法改善プロジェクト用 テンプレート コース改善プロジェクト用 テンプレート ビデオを利用した授業分析用 テンプレート

「元祖」 SoTLプロジェクト・テンプレート



「Snapshot」をグループ化し、目的に応じた eポートフォリオを組み立てる

SoTL Project Snapshot Course Transformation Snapshot Class Anatomy Snapshot



Hewlett Foundation
Higher Education Projects

Howard Hughes Medical Institute
HHMI Professors Program

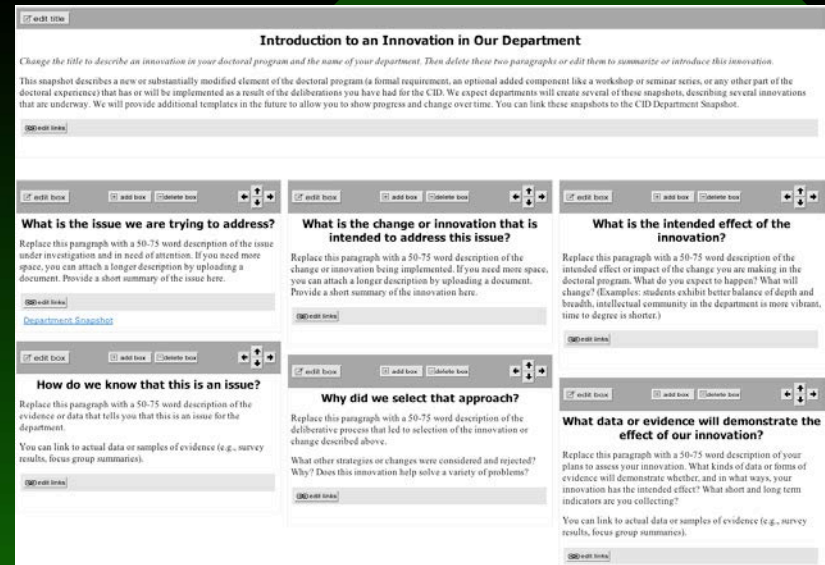


大規模で複雑な助成プロジェクトの過程と成果の記録と公開を支援

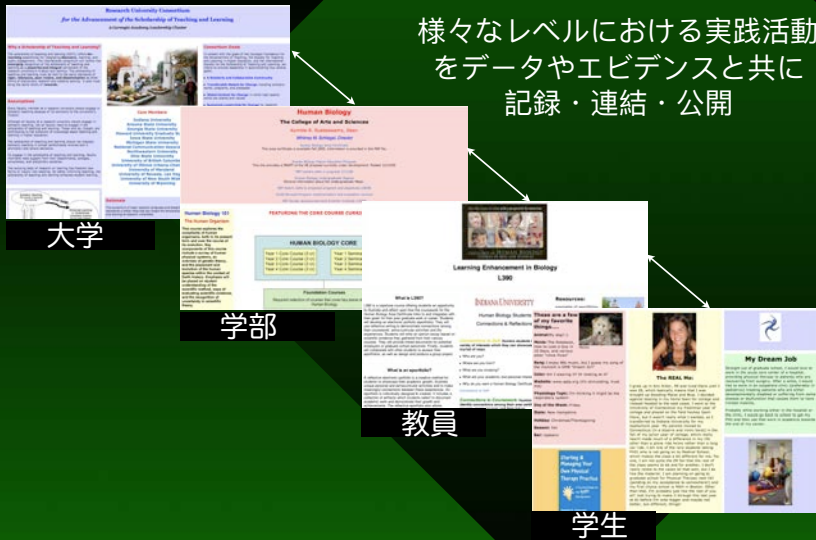
HHMI Professors Program (a.k.a. 1M\$ Profs)



- ★ 生物学教育における複数年にわたるカリキュラム開発・改善プロジェクトを記録・公開
- ★ 助成されたプロジェクトの過程や成果の評価の一環として、HHMIの理事がこれらの「SNAPSHOTS」を査読



様々なレベルにおける実践活動をデータやエビデンスと共に記録・連結・公開



プロジェクトやテーマ毎にeポートフォリオのオンライン・ギャラリーを作成し公開する

Howard Hughes Medical Institute KEEP Toolkit Project			
HHMI professors are documenting and sharing their ongoing work with HHMI, their peers, and eventually the greater educational community, in a comprehensive yet accessible format.			
	Manuel Ares University of California Santa Cruz	Hughes Undergraduate Research Laboratory Manuel Ares's research focuses on RNA processing and the structure and function of RNA, with special attention to the role of RNA processing in genome function and evolution. To encourage the development of scientist-teachers, he will recruit undergraduates to participate in a research group that will conduct genomic studies of splicing in humans and Plasmodium spp., the causative agent of malaria.	Aug 18, 2005
	Utpal Banerjee University of California Los Angeles	True Functional Genomics as an Undergraduate Research Experience As a researcher in the fields of Drosophila genetics and developmental biology, Utpal Banerjee is currently studying signal transduction and transcriptional control of neural and hematopoietic development. Using the Drosophila eye, pre-med undergraduates will work in Dr. Banerjee's lab to determine the function of a large number of genes in the eye that are currently defined only by their early lethal mutant phenotype.	Aug 25, 2005
	Sarah Elgin Washington University in St. Louis	Integrating Genomics into the Biology Curriculum Sarah Elgin's research focuses on the role of chromatin structure in gene regulation in fruit flies. In addition to developing an undergraduate course in genomics research and incorporating genomics investigations into existing freshman/sophomore biology courses, she will also work with K-12 teachers to develop genomics materials for their classrooms.	Jul 25, 2005
	Ellen Fanning Vanderbilt University	A Community of Scholars: A Project to Enhance Personalized, Inquiry-Based Undergraduate Education Ellen Fanning studies how DNA tumor viruses co-opt cellular proteins to circumvent the cell cycle regulation process and replicate themselves. She will recruit freshmen to spend the summer before their sophomore year as full-time research interns, rotating through several labs. During the next two summers, students may return as full-time research fellows, continuing their research and mentoring new interns.	Sep 15, 2005
	Hilary Godwin Northwestern University	Undergraduate Success in Science Hilary Godwin studies the basic chemical and biological mechanisms by which toxic metal ions affect neurological signaling and development. She will create the Undergraduate Success in Science program at Northwestern University. It will feature a summer workshop focusing on building skills that will allow students to excel in science.	Jul 04, 2005

Gallery of Teaching & Learning
Developed by the Knowledge Media Laboratory of The Carnegie Foundation for the Advancement of Teaching

Featured Work

- Learning in Community Colleges
- Curriculum Reform
- Teaching & Teaching Preparation

Subject Areas

- Arts
- Business
- Humanities
- Mathematics & Statistics
- Science & Technology
- Social Sciences

Carnegie Collections

- CCD
- CASTL HE
- CASTL K-12
- Inside Teaching
- Windows on Learning

Viewpoints

- Exhibitions
- KEEP Case Studies

Welcome to the Gallery

The Gallery of Teaching and Learning provides premier, digital representations of knowledge related to teaching and learning. The carefully crafted and vetted work of numerous participants of Carnegie Foundation programs and partners provides examples for individuals, projects, departments, institutions, communities of practice, and for the entire outreach.

Their work on educational transformation, the scholarship of teaching and learning, and teacher and faculty development is meant to inspire new forms of practice, elicit comment, and provide a basis for new knowledge. We invite you to browse the Gallery, find resources you might want to refer and link to in your KEEP Toolkit snapshots. You can also identify elements for H2O playlist annotation (this last line will be added when the H2O becomes available for the Commons users).

Browse, Learn, Reflect, and Get Inspired!

Gallery Spotlight

Linking Teaching and Learning by Linking Community Members
Nov. 27 2007

Since the spring of 2007, faculty members of the Writing Across the Curriculum project at the College of San Mateo have helped students build their portfolios using the KEEP Toolkit. In the process, faculty have found effective ways to collaboratively assess students' portfolios. The Toolkit also allows faculty and students to link their projects to individual Student Learning Outcomes. To learn more about their work with students, assessment, and integrative learning, [continue reading](#).

(<http://gallery.carnegiefoundation.org>)

CF THE CARNEGIE FOUNDATION FOR THE ADVANCEMENT OF TEACHING

カーネギー財団の教育改善・改革プロジェクトを通して作られたマルチメディアによる知識・経験表象 (eポートフォリオ) を、300以上所蔵。

カーネギー財団知識メディア研究所の取組 (2008)

A Space for Incubation
創発

A Space for Inspiration
啓発

A Tool for Knowledge Sharing
共有

A Space for Interaction
交流

Gallery of T&L

Workspace

KEEP Toolkit

T&L Commons

CF THE CARNEGIE FOUNDATION FOR THE ADVANCEMENT OF TEACHING

KEEP Toolkitを使って、世界中の38,000人以上の教育者や学生が、既に140,000以上もの教育的知識の表象(ナレッジ・オブジェクト)を生み出した。

CF THE CARNEGIE FOUNDATION FOR THE ADVANCEMENT OF TEACHING

Teaching & Learning Commons
Developed by the Knowledge Media Laboratory of The Carnegie Foundation for the Advancement of Teaching

Commons Manifesto

The Teaching and Learning Commons is an intellectual community space provided to enrich and encourage exchange of knowledge about teaching and learning. To participate in this collective effort, you are invited to:

- create representations of effective teaching practice
- share these representations with the community
- read, understand, and comment on others' work
- build on the work of other community members
- based on what is learned, re-create new representations to contribute to the commons.

Create
Problems & Solutions

Use
Assess & Revise

Share
Engage & Create

A Circle of Knowledge Building & Sharing

Knowledge Media Lab Staff Picks

- Kounai Ken**
Using video and descriptive text, this snapshot shares the results of 5 years of action research for professional development of Japanese teachers. - CRR
- Merlot Africa Network**
To help us understand the power of a technique, this site provides a very useful example for others to build similar networks. - CRR
- Glendale Community College**
To help us understand the power of a technique, this site provides a lesson plan, demonstration and voices of faculty and students. - CRR

Latest Blog Post

TLC Journal: Teachers as Collaborative Learners
May, 13 2008

Collaborative learning is an umbrella term that generally refers to educational approaches involving the joint intellectual effort of learners who work together toward a common goal. Educators and researchers often note the benefits of this method of instruction, citing such things as students sharing their strengths, developing weaker skills, dealing with conflict, being actively involved with material, and having more opportunities for feedback. And when collaborative learning happens, the success of one learner usually leads to the success of others. Everyone gains.

Commons Home

- My IdeaBank
- Community Favorites
- Teaching & Learning Blog
- Manifesto
- Commons Forum
- Newsletter

Login

email address
password

Forgot your password? Create an Account

Most Viewed IdeaLists

- Seeing student learning
- Teaching Commons
- Educational Technology
- Cross-discipline knowledge building
- Knowledge Sharing in Open Education
- math

Top Searches

- portfolios
- math
- educational technology
- Carnegie Academy for the Scholarship of Teaching and Learning
- classroom teaching
- soil
- lee shulman
- music
- physics
- Malaysia

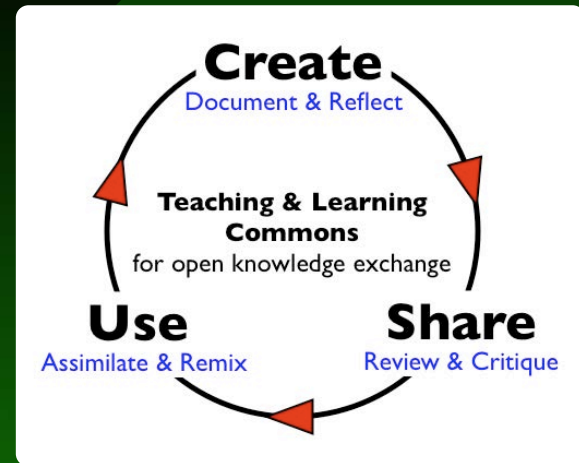
CF THE CARNEGIE FOUNDATION FOR THE ADVANCEMENT OF TEACHING

IdeaBank (自分の改善改善の役に立つSnapshotリスト)

The screenshot shows the IdeaBank interface. At the top, there's a header with the IdeaBank logo and a link to 'Add the Snapshot to My IdeaBank'. Below this, there are several sections: 'Published IdeaList' with a description and author's note, 'Mathematical Models Revisited' (published July 3, 2006), 'Adult Education Portfolio' by Peter Schuster, and 'Demetrius 2007 Curriculum Ambassador Experience' by Peter Schuster. Each section includes a thumbnail image and a brief description.

CF THE CARNEGIE FOUNDATION FOR THE ADVANCEMENT OF TEACHING

A Circle of Knowledge Building and Sharing 教育的知識の構築と共有の(生成-共有-利用)循環



CF THE CARNEGIE FOUNDATION FOR THE ADVANCEMENT OF TEACHING (Iiyoshi & Richardson, 2008)

Gallery of Educational Innovation

The screenshot shows the 'Gallery of Educational Innovation' website. It features a navigation menu with 'Home', 'Subject Areas' (Arts, Business/Management, Humanities, STEM, Behavioral & Social Sciences, Cross-Disciplinary, All Subjects), and 'Themes' (Collaboration, Active Learning, Cross-Media, Visualization and Simulation, Open Education). There are also 'Collections' like 'iCampus', 'OEIT STAR', and 'Outside MIT'. The main content area highlights 'Featured Projects' including 'MIT MATHLETS' (Java applets for lecture demonstrations), 'Russian Revolution Timeline' (digital timeline showing social groups), and 'StarHydro' (software for fluid geometry). A footer contains contact information for MIT's Office of Educational Innovation and Technology.

by MIT's Office of Educational Innovation and Technology (2008)

Transforming Introductory Physics Courses:
From a Large Lecture Classroom to a Student-Centered Active Learning Space
John W. Belcher, Peter Dourmashkin, David Lister, and Judy Yehudi Dori

Massachusetts Institute of Technology Department of Physics
MIT Center for Educational Computing Initiatives

Studio Physics is a new format for freshman physics education at MIT that is designed to help students develop much better relation about, and conceptual models of physical phenomena. The format is centered on an active learning approach - that is, a highly collaborative, hands-on environment, with extensive use of interactive lectures and desktop experiments.

What is the focus of your investigation?

The motivation for moving to a different mode of teaching introductory physics courses was twofold: First, the traditional lecture and recitation format for teaching the mechanics and electromagnetism courses at MIT has traditionally had a 40-50% attendance rate, even with good lecturers, and a 10% or higher failure rate. Second, a range of educational innovations in teaching freshmen physics has demonstrated that actively engaging using interactive-engagement methods results in higher learning gains than the traditional lecture format. Finally, unlike many educational innovations in the US and around the world, the premiere introductory physics courses at MIT have not reduced a necessary component for most three-semester, B.S. programs, while continuing to face these crucial for understanding, and completing we were anxious to introduce.

The objective of the TEAL project is to transform the very physics, a large to large physics courses at MIT in order to decrease failure rates and increase students' conceptual understanding, as well as maximizing that quantitative problem solving skill. Innovative technology can be used to support meaningful learning by enabling the presentation of visual and dynamic images, which permit a more holistic, integrated concept. This is especially important in electromagnetism, where the concepts are hard to grasp and visualize.

Sponsored by the MIT Research Fund for Excellence in Education

Also supported by the MIT Research Campus Alliance Physics & EE course web site

What resources / references have you found helpful?

"Studio Physics" loosely denotes a format instituted in Fall 2002 (introduced by Professor Jack Wilson). This pedagogy has been modified and enhanced by a number of other universities, notably in North Carolina State University's SCALE program, under Professor Robert Beichner. Our approach is most similar to the SCALE Program.

The Scale-Up Project at NCSU



Fig. 1 Young Adult physics students in the adjacent Studio Classroom.

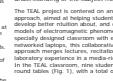


Fig. 2 David Rubin's entry for the West Field Contest



Fig. 3 David Rubin's entry for the West Field Contest

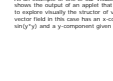


Fig. 4 Comparison of student scores on a pre-test and post-test for Spring 2002.

What were your approach and what tools were constructed to facilitate the students' understanding of the subject matter?

The TEAL project is centered on an active learning approach, aimed at helping students visualize, describe, and interact with, and conceptualize the phenomena. The TEAL approach involves active, and conceptualized, interactive lectures, and desktop experiments. This collaborative, hands-on approach merges lecture, recitation, and desktop experiments. The TEAL approach involves active, and conceptualized, interactive lectures, and desktop experiments. This collaborative, hands-on approach merges lecture, recitation, and desktop experiments. This collaborative, hands-on approach merges lecture, recitation, and desktop experiments.

What results have emerged?

The TEAL Project has had a robust assessment and evaluation effort undertaken since its inception. This effort is led by Professor Judy Yehudi Dori, a faculty member in the Department of Education in Technology and Science at MIT. The effort uses a variety of assessment techniques, including the pre and post tests, concept inventories, team projects, questionnaires, and pre and post testing. Our pre and post tests consist of 20 multiple choice questions covering basic concepts in electromagnetism. Some of these questions are taken from well-validated tests that have been developed and used at other institutions, and some of these questions were developed at MIT.

Figure 2 shows the results of the pre and post testing for Spring 2002 (02). The results are given for three categories of student scores: High, Intermediate, and Low. This separation allows us to gauge the effectiveness of instruction across the range of student backgrounds. The separation is also given for the pre and post tests. The difference between the pre and post scores is a measure of the effectiveness of instruction.

To substantiate these results, the learning gains in TEAL Spring 2002 is assessed in terms of the overall score on the pre and post tests. In particular, we compared our results in TEAL to the standard MIT freshman introductory course taught in Spring 2002. The fact that interactive-engagement methods results in higher learning gains when compared to traditional instruction indicates the results of many studies obtained at other universities, including Harvard.

Note about TEAL and its assessment and evaluation

Transforming Introductory Physics Courses: From a Large Lecture Classroom to a Student-Centered Active Learning Space

John W. Belcher, Peter Doumashkin, and David Lilabur
Massachusetts Institute of Technology

Studio Physics is a new format for freshman physics education at MIT that is designed to help students develop much better intuition about, and conceptual models of, physical phenomena. The format is centered on an active learning approach - that is, a highly collaborative, hands-on environment, with extensive use of networked laptops and desktop experiments.

What is the focus of your investigation?

The motivation for moving to a different mode of teaching introductory physics courses was threefold. First, the traditional lecture and recitation format for teaching the mechanics and electromagnetism courses at MIT has traditionally had a 40-50% attendance rate, even with good lecturers, and a 10% or higher failure rate. Second, a range of educational innovations in teaching freshman physics has demonstrated that any pedagogy using interactive-engagement methods results in higher learning gains than the traditional lecture format. Finally, unlike many educational institutions in the US and around the world, the mainline introductory physics courses at MIT have not included a laboratory component for over three decades. Experiments were something we felt were crucial for understanding, and something we were anxious to re-introduce.

The objective of the TEAL project is to transform the way physics is taught to large physics classes at MIT in order to decrease failure rates and increase students' conceptual understanding, as well as maintaining their quantitative problem-solving skills. Visualization technology can be used to support meaningful learning by enabling the presentation of spatial and dynamic images, which highlight relationships between complex concepts. This is especially important in electromagnetism, where the concepts are hard to grasp and visualize.

*Supported by the d'Arbeloff Fund for Excellence in Education
Also supported by the MIT/Microsoft Campus Alliance
Physics 8.01T course web site*

What resources / references have you found helpful?

"Studio Physics" loosely denotes a format instituted in 1994 at Rensselaer Polytechnic Institute by Professor Jack Wilson. This pedagogy has been modified and elaborated on at a number of other universities, notably in North Carolina State University's Scale-Up program, under Professor Robert Beitcher. Our approach is most similar to the NCSU Program.

The Scale-Up Project at NCSU



Fig. 1 Undergraduate physics students in the d'Arbeloff Studio Classroom.



Fig. 2 David Rush's entry for the Weird Fields Contest Spring 2004. Weird Fields Contest. As Reported in [Weird Cont.](#)

What results have emerged?

The TEAL Project has had a robust assessment and evaluation effort underway since its inception. This effort is led by Professor Judy Yehudi Dori, a faculty member in the Department of Education in Technology and Science at the Technion. We use a variety of assessment techniques, including the traditional in-class exams, focus groups, questionnaires, and pre and post testing. Our pre and post tests consists of 20 multiple choice questions covering basic concepts in electromagnetism. Some of these questions are taken from standardized tests that have been developed and used at other institutions, and some of these questions were developed at MIT.

Figure 3 shows the results of the pre and post testing for Spring 2003 8.02. The results are given for three categories of student scores: High, Intermediate, and Low. This separation allows us to gauge the effectiveness of instruction across the range of student backgrounds; the separation is made using the student score on the pre-test. The difference between the pre and post scores is a measure of the effectiveness of instruction.

d'Arbeloff Interactive Mathematics Project (d'AIMP): Mathlets


Haynes R. Miller
Department of Mathematics, MIT

Computer Manipulatives in an Ordinary Differential Equation: A paper in *Journal of Science Education and Technology* (2001), Pp31

For what discipline, course, intended learning objectives and intended learners are these learning materials designed?

The basic undergraduate differential equations course at MIT, 8.03, is taken by some 85% of all undergraduates in their freshman or sophomore year. This course faces several challenges common to such courses across the country. A grant from the d'Arbeloff Fund for Excellence underwrote a project to address these challenges. A principal outcome has been the creation of a suite of Java applets for use as lecture demonstrations and, most importantly, as the basis for homework assignments. These applets can be used directly or in modified form in classroom courses, enhancing transfer.

*MIT Differential Equations (Spring 2006, OpenCourseWare)
See the problem sets (in Assignments) and the Mathlets used (in Tools)*



Introduction (3 min.)

How did you, or do you, use these learning materials when teaching?

These applets are used as lecture demonstrations and, more importantly, as the basis for homework assignments. Each applet represents information in several forms, linked by placement or color. This linkage helps convey the connection between physical system, the parameters specifying the differential equation, and the graphical representation of solutions. System parameters or initial values are varied by means of sliders, and the effect on solutions is represented dynamically. Students enrich their understanding by making measurements and then verifying them by calculation.

What pedagogical, teaching or learning problem(s) were you trying to solve by developing these learning materials? For example, was this designed to help you explain or illustrate a concept that students find hard to learn?

Three dilemmas face basic university mathematics courses, especially differential equations courses.

What refinements have you made (and/or are you planning to make) to the learning materials?

Work on creating these manipulatives began in Fall 2000. They were initially written in True Basic by Yu. Itoh. In Spring 2002, they were used in homework and for classroom demonstrations in a large differential equations class. They were presented as exercises and the students had to use them in on-campus computer clusters. In Fall 2002, Deborah Lipton joined the team and began an intensive formative assessment of the manipulatives as they evolved at the time. This resulted in numerous improvements that were incorporated in time for use in homework assignments in Spring 2003. An extensive survey and interview study was conducted with students to learn about the way in which they used the manipulatives in that class. These data led to a better understanding of how students responded to this pedagogical medium, and to substantial improvements in the applets themselves. The manipulatives have been a staple in the course since then. In Spring 2002, a programmer began porting the code to Java, with a student programmer completing the project by Fall 2003.

Since then, many technical improvements have been introduced, leading to better advantage of the power of Java. Moreover, many new applets have been written, often reaching beyond the limits of the curriculum of 8.03. (Example: Series B/C Circuits was built in Spring 2007 for use 8.02, Electromagnetism, and Physics Plus was built with advice from Susan Wittich in Fall 2008 for use in her Aerospace vehicles course.)

What advice would you give other faculty in using these materials/methods in their own courses?

1. Don't overuse these in lecture. Think carefully about what you want to illustrate and practice your art.
2. You have to explain every component you want students to learn, and talk through what you are doing, slowly and carefully.
3. Incorporating into homework is more effective than use in lecture. Use a program to prompt students with a goal.

Why do you believe these methods and learning materials are more effective in accomplishing your learning or teaching goals than other methods and materials? Please describe, if useful, work you've done and/or other colleagues' work.

Scholarship of Teaching and Learning (カーネギー財団発祥)

- 教授実践を公開する。
- Peer Reviewを通じた建設的意見交換を行う。
- 互いの実践から学び合い、個人・コミュニティとして教育実践の改善に関する知識共有・構築を行う。

概念的類似性が高い!

相互研修型FD (京都大学高等教育研究開発推進センター発祥)

MOST: Mutual Online System for Teaching & Learning



<https://most-keep.jp>

全ての大学・大学教員が利用可能 (京都大学高等教育研究開発推進センターが運営)

日本版CASTL：MOSTフェロップログラム@京大

MOSTフェロップログラム

↓ 第9期MOSTフェロー ↓ 第8期MOSTフェロー ↓ 第7期MOSTフェロー

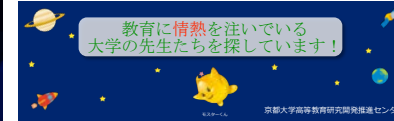
↓ 第6期MOSTフェロー ↓ 第5期MOSTフェロー ↓ 第4期MOSTフェロー

↓ 第3期MOSTフェロー ↓ 第2期MOSTフェロー ↓ 第1期MOSTフェロー

本センターでは、大学教育改善を全国レベルで推進する「MOSTフェロップログラム」を2012年度より提供しています。毎年、全国から選ばれた10名の大学教員が、1年間かけて、対面とオンラインで交流しながら個々の教育改善に取り組むとともに、教員コミュニティの成長も目指しています。その成果はMOST上で公開するとともに、大学教育研究フォーラムで発表しています。

<http://www.highedu.kyoto-u.ac.jp/most-fellow/>

第9期MOSTフェロー 募集!!



京都大学高等教育開発推進センターでは、全国の大学教員を対象とした教育改善のための「MOSTフェロップログラム」を提供しています。現在、第8期の10名の大学教員が、対面とオンラインでのコミュニティ活動を通じ、仲間から刺激・アイデア・フィードバックを得ながら個々の教育改善に取り組んでいます。この活動をさらに推進・活性化させるため、引き続き「第9期MOSTフェロー」を募集することになりました。第1期から第8期の先輩フェローたち（77名）との交流があることも本プログラムの魅力の一つとなっています。大学や専門分野を超えて、教育というキーワードで集うフェローの仲間になってみませんか。

MOSTフェローになると・・・

- ・ 教育活動に情熱を注ぐ先生方と仲間になれる!
- ・ 仲間と取り組むことで教育改善に対する刺激やアイデアを得られる!
- ・ 活動の成果を大学教育研究フォーラムやMOSTを通じてアピールできる!
- ・ 先輩フェローたちとの交流が持てる!

第9期では、これまでに引き続き、アクティブラーニング、ピア・インストラクション、PBL（プロジェクト型学習・プロブレムベース学習）、オンライン学習・ブレンデッド学習、反転授業、オープンエデュケーションの教育利用などの授業を推進している先生方を募集します。また、本センターでは優れた教育実践の調査・共有促進を支援する大学教育コミュニティを運用しています。現場で実践に起こっている実践だけでなく、過去に作成されたスナップショットの事例を元にした新たな取り組みも大歓迎です。上記に挙げたテーマに限らず、ユニークな授業実践をさらに追求したい方、これを機に新たな授業改善に挑戦したい方のご応募お待ちしております!



募集内容

本取組への参加を希望される方は下記の募集要領に従ってお申込みください。

- 対象者：全国の大学教員
- 募集人数：10名程度
- 活動期間：2019年3月～2020年3月
(※右のすべての活動への参加が必須です)
- 活動費：各自でご負担頂きます
- 応募締切：2019年1月21日(月)

2019年

- 3月25日(月) 10:30～13:00
第1回会合(於：京都大学)
- 4月～8月：テーマに沿ったスナップショットの作成とピアレビュー
- 8月24日(土)～25日(日)：
合宿(1泊2日)(於：北海道大学(予定))

2020年

- 3月：スナップショット公開
- 3月：第26回大学教育研究フォーラム
(於：京都大学)で成果発表

募集要領

MOSTフェローへの参加を希望する方は、以下の項目(1)～(9)をメールにて most.f@highedu.kyoto-u.ac.jp 宛にお送りください。なお、採用の可否については、締切日から1週間後を目処に、個別にメールにてお知らせします。

- (1) 氏名 (2) 所属(大学名・部署名) (3) 職名 (4) メールアドレス
- (5) 取組のテーマ(下記の「取り組みの例」参照)
- (6) 取組の範囲*
 - (a) 個人が取組 (b) 学内の教員グループでの取組 (c) 学科・学部等、組織的な取組
 - (d) 大学を基えた教員グループの取組 (e) (a)～(d)以外(具体的に：)

注：この項目は取組の規模をお尋ねしており、グループや組織での応募は行っていません。応募は教員単位となります。
- (7) 応募の動機、取組の背景、授業の概要、改善の内容・方法など(A4サイズ1枚程度)

注：過去に作成されたスナップショット(参考：MOSTエッセイ)の事例を元にした新たな授業実践の場合は、どのスナップショットをどのように発展させるのかについての具体的な計画も含めて下さい。
- (8) その他、取り組みに関して選考の参考となる資料(任意)

MOSTフェロップログラム(2012～)

教育に熱い大学教員による授業改善のための実践コミュニティ



MOSTフェロー(第1～6期)

MOSTコミュニティの活動：表彰



MOSTフェロー（第7期）修了式 3.24.2019

53

MOSTフェローシッププログラム (2012～)

教育に熱い大学教員による授業改善のための実践コミュニティ



MOSTフェロー（第8期）夏合宿@北海道大学 (2019)

54

MOSTコミュニティの活動：フェロー同士の研鑽



55

MOSTコミュニティの活動：フェロー同士の研鑽



56



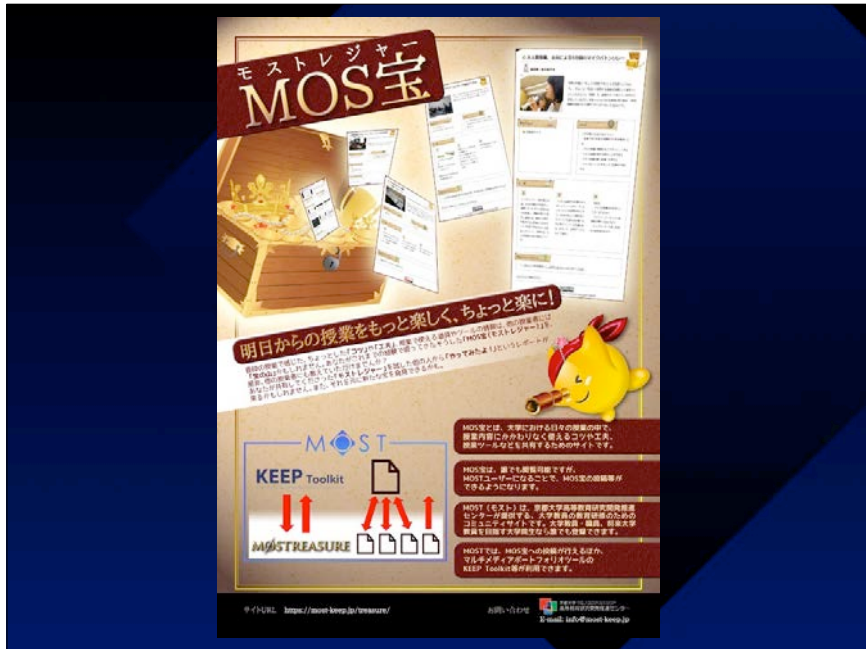
<https://most-keep.jp/most/>



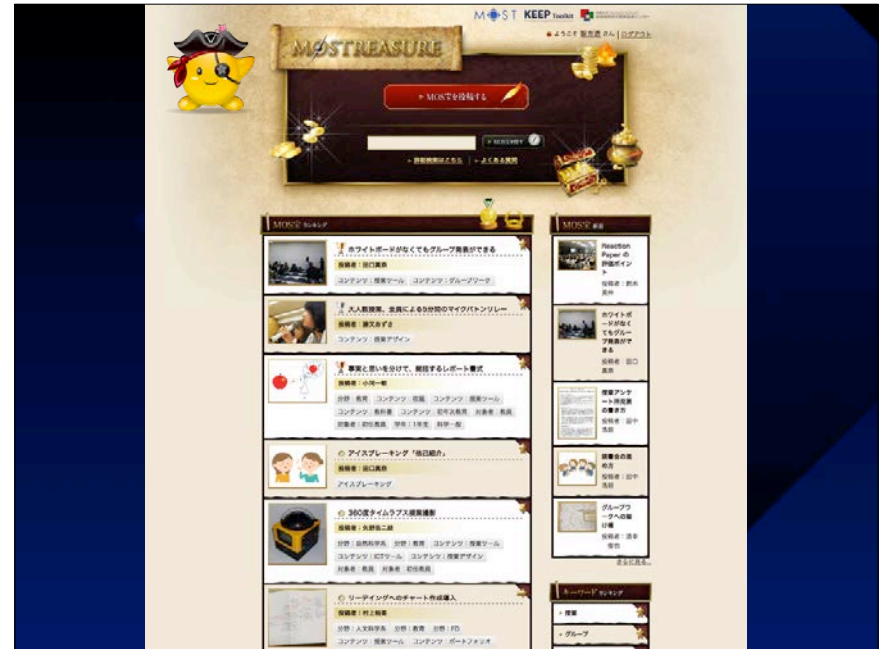
第8期(2019年度)MOSTフェローのスナップ



MOSTフェローのスナップショット



61



62



63



64

MOSTオンライン夏合宿 (2020)

タイムスケジュール

8月22日(土)【1日目】

時間	内容
15:00 ~ 15:30	開会のご挨拶
15:30 ~ 16:20	9期グループディスカッション(GD)1
16:20 ~ 16:30	休憩
16:30 ~ 17:20	9期グループディスカッション(GD)2
17:20 ~ 18:00	休憩(懇親会の用意)
18:00 ~ 20:00	懇親会

8月23日(日)【2日目】

時間	内容
10:00 ~ 12:00	9期発表準備 & 同意会(自由参加)
12:00 ~ 13:00	昼食(自由参加)
13:00 ~ 15:00	9期最終発表1人12分×9名
15:00 ~ 15:30	閉会のご挨拶

備考
 ・GD1、2の時は、Zoomの名前の前にグループ番号の表示をお願いします(例: グループ番号 X期 名前)。GD1終了後休憩前にGD2のグループ番号に変更をお願いします。
 ・各グループに分かれた後、自己紹介してから議論を進めていただければと幸いです。議論が早く終わったグループでは、9期の先生方は発表スライドの加筆修正も可能です。
 ・GD2では、自己紹介の後、9期の先生はGD1で出た議論の内容の要約と修正点を説明していただけると、効果的に議論を進められるのではと思います。

先輩フェローたちにプレゼンをし、形成的な改善アドバイスをもらう

同期・先輩フェローたちに総括プレゼンをし、今後の取組についてアドバイスをもらう

MOSTオンライン夏合宿 (2020)



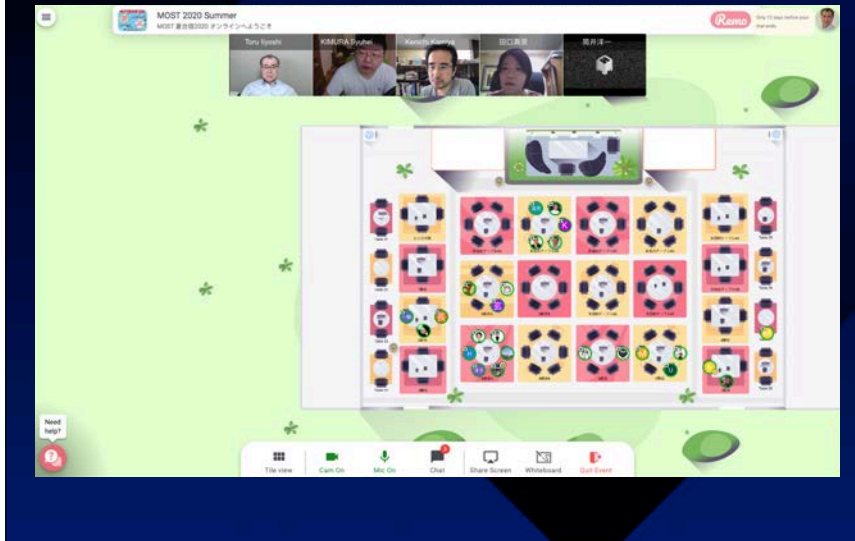
MOSTオンライン夏合宿 (2020)

「自立と体験1」の特徴 10年間の実践の成果

- 学生の自己評価は、以下の4項目で10年連続プラスに変化
「自分の意見を断言して話す」「自分の意見を文章でわかりやすく表現する」「明星大学の歴史や教育の特色を知っている」「大学の図書館の利用方法を知っている」
- 授業の特徴に対する評価は、以下の3項目で肯定的回答が90%超
「少人数クラス」「グループでの学習活動」「他学部・他学科の学生との交流」(10年間の平均)
- 出席率 9年間の平均85.5%、2020年度87.1%(最高値)
- 単位修得率 9年間の平均94.0%、2020年度95.2%(最高値)
- 離籍者の減少(他の要因の影響も含む)
4年在籍率 78.1%(2016年入学者) ※参考:66.3%(2009年入学者)
3年在籍率 86.6%(2017年入学者) ※参考:73.7%(2009年入学者)
2010年度入学者より「自立と体験1」開講

MOSTオンライン夏合宿 (2020)

テーブルを幾つも巡って雑談も可



MOSTフェロー発表会(祭典?)

FD笑百科 (2015)

FD笑百科

Ask Faculty Development Gurus

第21回大学教育研究フォーラム

◎京都大学吉田キャンパス

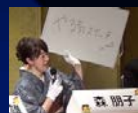
2015年3月13日(金)

FD笑百科とは？

大学教員の教育能力向上 (Faculty Development) に関するさまざまなお困りごと、お悩み、ご相談を MOSTフェローやゲストの方々、そして会場の皆さんと一緒に考えるコーナーです



MOSTお宝鑑定団 (2016)



MOSTフェロー発表会

「モストDE データー異分野コラボレーションによる共同的授業実践の創発」
13:30~14:30 百周年時計台記念館1F 百周年記念ホール

趣旨

京都大学高等教育研究開発推進センターでは、特徴ある授業実践をおこなっている全国の大学教員が参加するMOSTフェローシッププログラムを、2012年より実施してきました。MOSTフェローは、対面やオンラインで交流しながら、1年間かけてそれぞれの授業改善に取り組み、授業実践の中で直面する様々な教育的課題を相互の実践知から解決する大学教員の情報共有コミュニティを目指して活動しています。

現在、第5期9名が活動中ですが、近年、すでに修了証を得た第1期から第4期までを含めたMOSTフェローの相互交流が活発になりつつあります。その活動の一つとして、MOSTフェローの専門分野が多様であることを活かした、異分野コラボレーションによる共同的授業実践が挙げられます。

米国の教育学研究者である Lee S. Shulman は、SoTL (Scholarship of Teaching and Learning) を推進するためには、分野横断的に良き教育実践から学びあい、実践を積み重ねていくことが重要であることを強調しています。「教育実践コミュニティ」「実践と振り返りのコミュニティ (Community of Practice and Reflection)」として相互・創発的に授業改善をおこなうことは、多様化する大学教育実践の課題に対処するための有力な方策であるといえます。

本発表では、異分野コラボレーションによる共同的授業を実践された先生方の事例を楽しく紹介することで、このような「新しいFDモデル」の可能性をみなさんと考えてみたいと思います。

モスト DE デート (2017)



73

MOSTフェロー発表会

「MEGA CRISIS 巨大危機 IN CLASSROOM～脅威と闘う教員たち～」

13:30~14:30

百周年時計台記念館 1F 百周年記念ホール

趣旨

京都大学高等教育研究開発推進センターでは、特徴ある授業実践をおこなっている全国の大学教員が参加するMOSTフェローシッププログラムを、2012年より実施してきました。

現在、第6期10名が活動中です。MOSTフェローは、対面やオンラインで交流しながら、1年間かけてそれぞれの授業改善に取り組み、授業実践の中で直面する様々な教育的課題を相互共有し解決する、多様な大学教員の実践コミュニティとして活動しています。第1期から第5期までを含めたMOSTフェローの相互交流の中から、新しい授業実践や研究活動が生まれています。

MOSTフェローコミュニティでは、グッドプラクティスだけではなく、失敗事例や未解決の難題も共有されます。本コミュニティは、教育経験や所属する大学、専門分野が異なれど教育に情熱を傾けるといふマインドセットや価値観を共有するコミュニティであるからこそ、多様なアイデアを交換し合いながら、よりよい実践知を生みだします。

本発表では、授業や教育実践の中で実際に起こった「クライシス」を題材に、様々な困難をどうやって乗り越えていけばよいかを考えます。

74

MEGA CRISIS 巨大危機 IN CLASSROOM (2018)



75



76

この9年間のMOST等の取組を通じた 日本におけるSoTL的活動を振り返って

- 日本でもSoTL的取組を成功させることが可能！（しかも楽しく）
- 人・仕組み・仕掛けが大事（お金はそれほど要らない！）
- SoTLを持続・発展させていくためには、「参加教員のより良い教育への情熱と関心、互いの実践に対する興味と互いに学ぼうとする姿勢」が肝要
- オープンで求心力を持った緩く温かいコミュニティの醸成と
その中における分散的リーダーシップの涵養
- 「縦・横・斜め」の関係づくりの推進
- プロセスと成果の見える化 × 相互的Peer Review・研鑽・奨励
- LMS・オンライン会議ツール等のICT活用と授業ビデオ・教材・
提出課題・成果物・ディスカッション等の電子化が進んだこと
はエビデンスベースの教育改善にとって追い風

77

今後の日本の大学におけるSoTLの可能性と課題

- トップダウン（制度・体制重視）とボトムアップ（文化・コミュニティー重視）なFD・教育改善の相乗効果
- 同一大学・学部・学科別 vs. 分野・組織を越えた越境的（Cross-Disciplinary）・個人的同胞性
- 個人（もしくはグループ）の教員による自発的な教育改善の取組
と成果の見える化、教育的知見・価値の創造と共有
- 既存のフレームワークや基準を越えたカリキュラム/授業改善の
（取組への意欲、弾力、やり抜く力を含めた）評価・報賞
- （ポストコロナ時代を見据え）激動のコロナ期を通じた新たな
教育改善・FDの形・方法の模索

78