University 2.0:
Blended Learning in NTU:
Making online learning work effectively in a HELPful way

Assoc Prof Daniel Tan + Ling KV & Kenneth Tan
Centre for Excellence for Learning & Teaching
http://www.celt.ntu.edu.sg
ethtan@ntu.edu.sg
Outline

• Background
  – What is *Blended Learning*?
  – What does it mean to NTU?
• Guiding Principles in Designing Online Learning Content
• Developing Online Content in NTU
• Findings and Observations
• What our students think
Gen Y, Millennials, Net Generation

- Born between 1977 and 1997
- Tech savvy
  - Continually connected
  - Socially connected
- Cosmopolitan
  - Influenced by peers
- Seek recognition and fame
- Pro-consumerism
- Short attention span
  - Skim text and information quickly
Designing experiences for Gen Y

**Immediacy**
- Expose immediate value
- Refresh and update content constantly
- Provide positive feedback

**Gen Y literacy**
- Keep user instructions simple
- Use sentence fragments and images, not text
- Speak in Gen Y’s language

**Individualism**
- Allow multiple levels of personalization
- Allow for self-aggregation

**Social interactivity**
- Provide ability to communicate with others
- Offer tools for self-expression

FORRESTER
What we have done
• depicts learning as an adventure to explore new frontiers of knowledge and that our NTU students are adventurous, creative and techno-savvy

e: electronic, everything!
ed: education
edveNTUre: our university’s name “NTU” is embedded
edveNTUre: eLearning Eco-System
https://edventure.ntu.edu.sg

Wiki on Facebook
The superb wiki of George Siemens on Facebook and its benefits as a social network service. The wiki gives a nice overview of when which social network was started. After that he zooms into Facebook with a good analysis on pros and cons if you want to use it in a corporate or other environment for educational reasons.

The Facebook Classroom: 25 Facebook Apps That Are Perfect for Online Education
With so many students, teachers, and librarians on Facebook these days, the social media site has become somewhat of a platform, offering developers a way to create and share applications for education. This, of course, is great news for online education, as it provides all sorts of great tools designed to
Leaps of growth ...

- Jul 00 (Phase I: Mass buy-in, Efficient Learning)
  - 870 (51%) courses on-line, 20,000 users
  - 30,000 – 80,000 page views daily
  - Saturation levels for adoption number of courses, instructors and students
  - Critical mass buy-in and adoption

- Jul 02 (Phase II: HumaniZing eLearning)
  - 1,349 (80%) courses on-line, 22,000 users
  - 100,000 – 300,000 page views daily
  - Change of content type - Content +

- Jul 04 (Phase III: Effective Learning)
  - 2,900 (>90%) courses on-line, 24,000 users
  - 300,000 to 600,000 page views daily
  - Content management system and re-use of content

- Jul 06 (Phase IV: eLearning 2.0)
  - 3.5M page-views/week
  - Engaged and interactive learning
  - Collaborative learning
  - Learning by discovery: eUreka Project Work

- July 07 (Phase V: University 2.0)
  - 9M page-views/week
  - Participative learning, virtual communities
  - Sigma learning model
Features of edveNTUre

- Content Creation and Delivery
- Online Assessment

- Community Learning
- eUreka Project Work
THE 21st CENTURY CAMPUS

“Available for all” campus-wide initiative and holistic operational approach in

- Teaching
- Learning
- Innovation & Research

vs innovations by instructors at course module levels
What we are doing ...
# Operational Elements of University2.0@NTU

(Today)

<table>
<thead>
<tr>
<th>edveNTUre</th>
<th>Ecosystem Framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>preseNTUUr</td>
<td>eLectures, podcasts, vodcasts</td>
</tr>
<tr>
<td>vFAQ</td>
<td>Short video DIY clips</td>
</tr>
<tr>
<td>eUreka</td>
<td>Project Work Management System</td>
</tr>
<tr>
<td>aNTUna connect</td>
<td>Virtual communities and IM</td>
</tr>
<tr>
<td>Bb Scholar</td>
<td>Cross-campus disciplinary-specific Social bookmarking</td>
</tr>
<tr>
<td>Bb Sync</td>
<td>Facebook communication</td>
</tr>
<tr>
<td>Flickr, YouTube, ePortfolio</td>
<td>Communities</td>
</tr>
<tr>
<td>Clickers Audience Response System</td>
<td>Active learning in Lectures</td>
</tr>
<tr>
<td>LAMS</td>
<td>Re-usable learning pathways</td>
</tr>
</tbody>
</table>
σ

Σ

σ

Sigma Model

\[ f(x) = \frac{1}{\sigma \sqrt{2\pi}} e^{-\frac{x^2}{2\sigma^2}} \]
Unique in Education
… and a few other professions

• Education do not guarantee their products....
Effectiveness

No of Students vs. Performance Distribution

-- Traditional
-- eLearning
Effectiveness – the mature model

\[ \alpha - \text{more students doing better (peak-to-peak)} \]

\[ \beta - \text{better mean student performance} \]

\[ \partial - \text{higher performance} \]

\[ \rho - \text{lower failure rates} \]
The best way to predict the future is to invent it.

Alan Kay
If we can reverse engineer the outcome, what can we do?

Starting with the end in mind, what can we do to achieve this desired outcome?
Experimental concept: **Sigma Model: Teach less, Learn more**

- **Effective learning** via integrated 3-in-1 practice module of:
  - Live + recorded lecture review for knowledge learning
  - Discussion/forum/virtual tutorial for opportunity to formulate and articulate deep questions
  - Self eAssessment for multiple timely feedback
You have taught them;
Have they learnt?

Thomas C. Reeves
Professor Emeritus of Learning, Design, and Technology
University of Georgia
if
and
then

Content is King
Infrastructure is god

Learning Activities will create the economy

Redefined roles of instructors using the new pedagogies
Quality from Different Perspectives

• Quality of content
  – Usually not the issue
    • Standard textbooks, derivative material, multimedia courseware

• Quality of teaching process
  – You have taught them; have they learnt?

• Quality of the (self-directed) learning process
  – Impact on
    • Student performance,
    • Institutional reputation
    • Student value-add quality

Sigma will answer: Yes/No
Blended Learning

“a learning environment that exploits both, the benefits of face-to-face (F2F) and multiple technologies, to deliver online instruction”

Face-to-Face:
• social interactions in the classroom
• immediate feedback

Online instruction:
• flexibility of delivery
• high availability of course content
• anytime, anywhere

Effective Engagement
Blended Learning & HELP Model

• HELP: Highly Engaged Learning Pedagogy
• Online lessons must be populated with interactive, participative and collaborative content/activities
  • Pre-F2F activities
  • Supplementary resources
  • Follow-up activities to F2F lessons

Advantages
• students can access content anytime, anywhere
• students enjoy a multimedia experience
• instructors can cut back on content delivered in F2F lessons
eLearning Tools available in edveNTUre
preseNTUr for Self-paced Learning

Equation for Planes in Space

If \( P_0(x_0, y_0, z_0) \in M \), and \( \mathbf{n} = ai + bj + ck \) \( \perp \) to \( M \) then with \( \forall P \in M \):

\[
\begin{align*}
\text{Plane } M & \quad \text{Normal vector } \mathbf{n} \\
\text{Point } P(x, y, z) & \quad \text{Point on plane}
\end{align*}
\]

FE1006 Mathematics 1
Lecture 4 4-1
and the HELP Model

- Learning Activities Management System
- Open-sourced software developed by Macquarie University
- Easy to use; drag-and-drop interface
- Many learning activity tools, supporting interactive pedagogy
- HELP Model enabled by pedagogically-driven design
- Integrated into edveNTUre
Pre-recorded Video with Online Activities (discussion board)

### Week 10/11: Self-Access Session

**Oral Skills**

**Final Online Practice for Oral Presentation**

- Listen to the *recorded speech* (10 minutes)
- Give your feedback on areas identified. (45 minutes) 15 min per forum
- Do a peer review with the person assigned to you. (45 minutes) 15 min per forum
- Tutor will review your feedback and give final comments. (20 minutes)

Please refer to the sample schedule below to arrange the timing for your tutorial group’s synchronized oral activity.

**Sample schedule**

- 3.30 pm to 3.40 pm  
  listen to the presentation
- 3.40 pm to 4.25 pm  
  give individual feedback
- 4.25 pm to 5.10 pm  
  review assigned partner’s feedback
- 5.10 pm to 5.30 pm  
  tutor will review and provide final feedback

*(Optional): Questions from Self Access Work*

From 5.30 pm to end of the week: As this will be your final session before the exam, you could use the discussion board to ask or clarify any doubts you may have of work completed in any of the self-access tutorials.
Use of LAMS (Learning Activities Management System) and Video Segments for Engaged Learning

Sun, Jan 06, 2008 – Welcome Letter

Welcome to M6426 Management of Technology and Innovation

- The syllabus lists class meeting time and venue
- Here are two useful getting-started guides: Orientation Video and Distance Education Study Guide

This course is an elective subject under MScs (Logistics) and is also open to other post-graduate programs’ students of NTU. The main focus of this course is to provide both strategic and operational perspectives of the process and organization in the management of technology, innovation and entrepreneurship. The course takes a multi-level view from the strategic analysis at the national level to the industry and enterprise levels, and to the management of product innovation and development projects. We will examine the key activities and issues at each of these levels of management.

As your instructors, our responsibilities are facilitating course interactions as well as imparting and sharing our knowledge.

As a student in this class, your commitment to learning is vital to your successful course experience. This involves developing content knowledge, learning skills, and awareness necessary to function as an independent thinker as well as a team player. I expect you to be challenged, be creative, and be engaged in your learning activities.

A/P Yeo and A/P Kumar
M6426-07S2 Management of Technology and Innovation

Getting Started: Course Site Orientation Video Distance Education Study Guide

Instructors: A/P Yeo Khim Teck, School of Mechanical and Aerospace Engineering A/P Arun Kumar, School of Mechanical and Aerospace Engineering

AY/Unit: Academic Year 2007/08 Semester II (3 Units)

Prerequisite: There are no prerequisites for this course.

Objectives: The main focus of this course is to provide both strategic and operational perspectives of the process and organization in the management of technology, innovation and entrepreneurship. The course takes a multi-level view from the strategic analysis at the national level to the industry and enterprise levels, and to the management of product innovation and development projects.

We will examine the key activities and issues at each of these levels of management. The course gives special emphasis to the roles and dynamics of technological innovation and change, and their implications on an enterprise's competitive advantage in the global marketplace.

Case examples will be used to illustrate and link theories and concepts with real-world experiences. The course notes are compiled to help the students to appreciate and develop relevant conceptual and methodological skills.
Course Materials Presentation Interface

Video Index

Learning Activity Links

Course Materials

Video Lectures and Learning Activities (Please start here)

Orientation and Demo

1. Demo (w/ vFAQ)
2. Demo 2 (w/o vFAQ)
3. Can't view videos? Click here for tips.
4. A Video Index containing videos-only files will be released weekly after each class.

Video Lectures and Learning Activities (Please review by 17).

Lecture 1: Technology and National Competitiveness

1. Introduction (5:54) L1 1-7 (contains an overview page and a video lecture page)
2. Productivity and Niche Strategy (17:13) L1 8-20
3. Multinational Corporations and Competitive Advantages (17:58) L1 21-38
5. Global Strategy (11:31) L1 54-60
6. Discussion Board (Your participation is compulsory)

Please review video lectures prior to the scheduled synchronous online meeting. There will be an discussion of the lectures during the online meeting.
1.0 Welcome to M6426: An Overview

Please click the above link to view video again.

Welcome to M6426 Management of Technology and Innovation!
You are about to view an introduction to the course and a greeting message. Please click the Play button to start the greeting video. When ready, please briefly answer the quick question below and submit your vote to proceed to the first video lecture located in next page.

Overview

One of the key course materials is a series of online learning activities containing video lectures, questions, and tasks that you can participate at your own pace or collaboratively with your classmates. The learning activities encourage you to integrate the knowledge learnt from this course and practical real-world cases, and to provide your own or synthesized perspectives to the key issues in management of product innovation and development at the enterprise to the national levels.

The goals of the learning activities are to help you reflect on your learning needs and to view diverse
Engage: Creating Purpose

Video 1.1: General Introduction
Please click the above link to view the video lecture. After viewing please answer the question below.

Time: 08:15
Notes: L1.pdf 1-5
Instructor: Ast/P Sunil Chandrakant Joshi

Question 1:
What are your learning objectives for this course? Remember, there is no right or wrong answer. However, it is important for you to answer as best as you can.

Answer:

[Blank field for answer]

Submit
1.5 What is the difference between globalization and regionalization?

HENG KHOON YEOW GERARD  11 Jan 08 02:48:13 PM
Globalization is the increasing economic integration and interdependence of countries across the globe, while regionalization is similar to globalization except that it is applied to countries within a specified geographic region.

LOW YOUNG HUAT  12 Jan 08 01:27:44 PM
When a business decides to go international by expanding its home market, it has to decide and select which geographic markets to operate basing on its commitment, resources and internalization strategy.

Regionalization can means doing business within a continent or in economic groupings like ASEAN, APEC, NAFTA and EU whereas globalization has widespread and significant operations across continents leveraging on each nation's competitive advantage. Eg, Electronical components can be manufactured in China and final assembly and marketing in Japan to attain the Made in Japan status.

ZAINUDDIN S/O ABDUL KADER A S  14 Jan 08 02:02:34 AM
Globalization can be described as a process by which the people of the world are unified into a single society. This process is a combination of economic, technological, sociocultural and political forces while regionalization is a process by which the world becomes less interconnected, with a stronger regional focus.
Synchronous Online Meeting

Synchronous Meeting Point

Meeting Room is open on Thursdays 7:00-8:30PM

Join Meeting

In the event the session you are about to enter unexpectedly terminates, please click the Helpdesk tab to enter a backup classroom.
Synchronous Virtual Session
Example: Experimental Aerodynamics

• **Background:**
  - Professor interested in developing a package to help students better understand wind and water tunnels in exploring aerodynamics
  - Limitation: wind and water tunnel facility cannot accommodate class of 140 enrolled students
  - Solution: professor create documentary-style video to induct students to wind and water tunnels
Dimensional Analysis

- For high speed flows even more problems:
  \[ Ma = \frac{U}{c} \quad Re = \frac{UL}{v} \]
- \( Ma \) and \( Re \) need to be held constant

Two possibilities:
1. Pressurized wind tunnel to change speed of sound
2. Assume Reynolds independency at high \( Re \) (incomplete similarity)
Lecture I - Setup of Experiments and Wind Tunnels

The next activity is a lecture on how to plan and setup an experiment and on how wind tunnels are designed.

To access the lecture click on the link below.

Recorded Lecture - Wind Tunnel (25m 06s)
An example involving Experimental Aerodynamics
An example involving Experimental Aerodynamics
Lessons: Deploying Learning Activities

• Set succinct and clear instructions
  – Expectations and deadlines

• Activities must be easy to find
  – Avoid having to constantly download plugins and client software
  – If possible, conduct usability test
Findings: Quality of Learning

- Segmentation of video course content + interactive learning activities
  - More engagement as more senses are used
  - More active participation
  - More thought
  - More reflections
- Develops more discerning learners
- More self-directed learning
- More peer-peer learning
- Professors have a better gauge of students’ learning
Findings: Outcomes of Learning Activities

• Collaboration with professor to create learning activities in LAMS to help students learn better

• Use of open-ended questions
  – Responses read by class-mates enhances students’ learning
  – Students learn from each other - peer learning
  – Students compare their responses with other students → awareness of different responses to same question
  – Student develops judgment on response quality
Answers from other Learners

Question:
Wind tunnels take up a lot of space compared to the relatively small size of the test section that can be used for experiments. Can you explain why?

Because for wind tunnels, the Reynolds number must be sufficient for the flow to be fully turbulent and thus simulate the real flow.

Reduce TI

Flow of low Turbulence Intensity is required to conduct an accurate experiment in the wind tunnel, thus the wind tunnel needs to have various components such as the settling chamber, contraction cone, diffuser and drive section to ensure that the air flow is of high quality.

wind tunnel contains other sections in addition to the test section. These include the settling chamber and contraction cone. For the closed wind tunnel, there is an additional diffuser. These sections are important in creating the correct flow for the test to be carried out. The settling zone will take out disturbances in the air flow, the contraction cone will reduce turbulence intensity and the diffuser allows recycle of air.

1) settle flow to decrease turbulence.
2) increase speed of flow in test section.

The majority of the space taken up by the wind tunnel is used for:
1) to let disturbance die out (settling chamber)
2) reduced turbulence intensity (contraction cone)
3) move the air flow (drive secion)
4) recycle the flow (for close wind tunnel)

Large contraction ratio is needed in wind tunnels to reduce turbulence intensity, and large contraction ratio need a large contraction chamber many times bigger than the test section. Also, a long gradual diffuser is needed after the test section to slowly expand the flow and prevent flow separation. These components thus result in a lot of space taken up by the wind tunnel.

The use of components, such as the settling Chamber, contraction cone and diffuser, to ensure the air flowing into the test section is of high quality and has a low turbulence intensity, result in the relatively large amount of space used for a wind tunnel.

it is to create a large settling camber so that the TI value will be small, so as to attain a large contraction ratio.

A lot of space is needed for the other components of the wind tunnel such as the diffuser, contraction and settling chamber. The settling chamber and contraction sections especially take up a lot of space as it needs to be many times the size of the actual test section in order to reduce Turbulence Intensity. As for a closed wind tunnel, additional space is needed for the drive section which is needed to circulate the air.

The wind tunnel consists of other components like the settling chamber which lets disturbances die out, contraction cone to reduce the turbulence intensity, diffuser and drive section which is made up of a large fan. Hence the overall size of the wind tunnel takes up a lot of space.
Findings: Notes of Caution

• Professors need to give regular feedback
  – Inaction or disinterest of the course instructor to online inputs led to waning participation
  – Most professors focus on F2F lessons & see online activities as self-learning supplementary resources

• Burn-out
  – Professors: too many responses and activities to deal with (esp with large classes)

• Fatigue
  – Students: too many courses with strong learning activities
Survey Findings

• Conducted between 2006 and 2008
• Wholly online course using the HELP model
• Average class size: 50 students per course
• Post-grad students
• 1 course in 5, in a given semester, conducted wholly online
• Incorporated virtual cafes for synchronous conference sessions
<table>
<thead>
<tr>
<th>No.</th>
<th>Question</th>
<th>M6102-M7102</th>
<th></th>
<th>M6426</th>
<th></th>
<th>EE6403</th>
<th></th>
<th>Average</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2007</td>
<td>2008</td>
<td>2006</td>
<td>2007</td>
<td>2006</td>
<td>Average</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>The course site is easy to use</td>
<td>94%</td>
<td>92%</td>
<td>100%</td>
<td>97%</td>
<td>94%</td>
<td>95%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>This online course is a useful way to learn the target subject matter.</td>
<td>80%</td>
<td>62%</td>
<td>89%</td>
<td>89%</td>
<td>87%</td>
<td>81%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>As a result of my experience with the course, I would like to take another distance education course in the future.</td>
<td>61%</td>
<td>50%</td>
<td>75%</td>
<td>76%</td>
<td>80%</td>
<td>68%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I am comfortable with electronic media to access course materials or complete assignments.</td>
<td>84%</td>
<td>77%</td>
<td>89%</td>
<td>95%</td>
<td>83%</td>
<td>86%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>I would recommend this course to others.</td>
<td>73%</td>
<td>62%</td>
<td>89%</td>
<td>87%</td>
<td>89%</td>
<td>80%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>I am satisfied with the support available for this course.</td>
<td>86%</td>
<td>90%</td>
<td>94%</td>
<td>97%</td>
<td>89%</td>
<td>91%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>The online system is technically reliable.</td>
<td>80%</td>
<td>85%</td>
<td>86%</td>
<td>76%</td>
<td>83%</td>
<td>82%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>The university provides satisfactory technological resources for me to complete this online course.</td>
<td>86%</td>
<td>94%</td>
<td>100%</td>
<td>94.6%</td>
<td>93%</td>
<td>94%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Distance education and lecture presentations can provide me with similar levels of information and experience.</td>
<td>61%</td>
<td>48%</td>
<td>69%</td>
<td>73%</td>
<td>80%</td>
<td>66%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Distance education course seems to lack a personal feel.</td>
<td>71%</td>
<td>79%</td>
<td>61%</td>
<td>65%</td>
<td>52%</td>
<td>66%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Distance education course is more flexible than a face-to-face course.</td>
<td>80%</td>
<td>69%</td>
<td>69%</td>
<td>87%</td>
<td>76%</td>
<td>76%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>I can use the skills and knowledge learnt from this course on my job and real-world tasks.</td>
<td>88%</td>
<td>92%</td>
<td>89%</td>
<td>95%</td>
<td>91%</td>
<td>91%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>I have worked harder for the distance education course than face-to-face traditional courses.</td>
<td>61%</td>
<td>83%</td>
<td>53%</td>
<td>62%</td>
<td>50%</td>
<td>62%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Overall, the course materials met my expectations.</td>
<td>90%</td>
<td>89%</td>
<td>83%</td>
<td>97%</td>
<td>85%</td>
<td>89%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Overall, the instructor(s) for this course met my expectations.</td>
<td>86%</td>
<td>83%</td>
<td>95%</td>
<td>95%</td>
<td>94%</td>
<td>91%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Overall I am satisfied with the distance education course.</td>
<td>73%</td>
<td>64%</td>
<td>86%</td>
<td>95%</td>
<td>89%</td>
<td>81%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
HELP Model: Interactivity & Sustainable Student Participation

- **Interactivity**
  - Cognitive engagement experienced by the student as he navigates his way through the lesson
  - Self-paced video instruction
  - Review of recorded lectures at one’s convenience
  - Choice of material to review

- **Participation**
  - Pace and involvement the student has over the lesson
  - Formative assessment to help students consolidate learning
  - Use of simulations to help students better visualize what they learn
  - Active participation by all

- **Collaboration**
  - Peer-to-peer learning
  - Development of social networks

- **Self-Motivation**
  - Self-directed learning
  - Review of fellow students’ contribution
  - Peer recognition
  - Peer pressure
You have taught them; Have they learnt?

Thomas C. Reeves
Professor Emeritus of Learning, Design, and Technology
University of Georgia
Awards, Achievements and Recognition

- IMS Learning Impact 2009
- ascilite Award 2008
- SiTF eLearning Organization of the Year 2007
- ZDNet Asia Smart50 Award 2006
- CIO 100 Honouree 2006
- National Health Group Distinguished Contributor Award 2005
- EMC Best Practice Award 2004 for eLearning Services
- CIO 100 Honouree 2004
- Intelligent20 Award 2003

- MoA With Blackboard: establishment of the Certified Education Centre
- MoA with LAMS International: establishment of LAMS Training Centre
- eLearning Centre of Excellence by Sun Microsystems
Students who ask better questions, are independent learners, deep thinkers and ethical leaders of the future.
THANK YOU!

Assoc Prof Daniel Tan
Centre for Educational Development
http://www.ced.ntu.edu.sg

e: ethtan@ntu.edu.sg