Migration of Clusters from Pre-session to Post-session: An Analysis of Elderly Students' Perceived Digital Literacy

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Background: Digital Literacy

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Digital Literacy

- The knowledge, skills, and behaviours to identify, locate, organize, use, and communicate information using digital devices.
- Information literacy required for members of knowledge society.

Background: Age Distribution of OUJ Students

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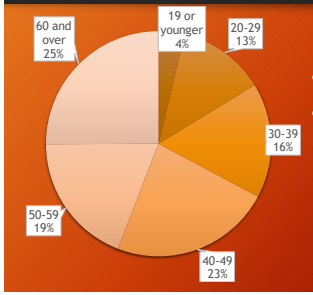

- Relatively old
- Low DL skills

Background: ICT Service of OUJ

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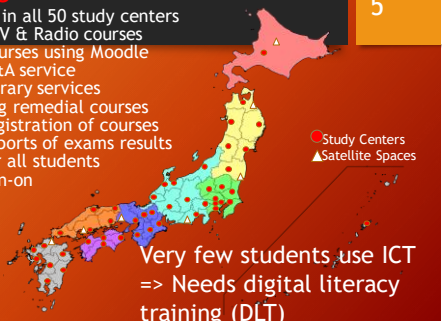
- PC rooms in all 50 study centers
- VOD for TV & Radio courses
- Online courses using Moodle
- Online Q&A service
- Online library services
- e-Learning remedial courses
- Online registration of courses
- Online reports of exams results
- E-mail for all students
- Single Sign-on



Very few students use ICT
=> Needs digital literacy training (DLT)

Literature: digital divide

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- the fundamental gap between those who have access to computers, the Internet, and online information and those who do not
- older age as one of the significant sources of the digital divide in addition to gender, salary, education, and professional practices (OECD, 2005)
- generation-specific media use reflects what people learned during their adolescence and with the media available at that time (Schäffer, B, 2007)
- cognitive abilities, computer self-efficacy, and computer anxiety as mediators of the digital divide (Czaja, Charness, & Fisk, 2006)

Literature: DL training for elderly people

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- learning program for the elderly be strongly facilitated by peer support as well as having a jointly planned content that is tailored to the needs, motivation, and ability of learners (Naumanen and Tukiain, 2010)
- younger age group made fewer errors, while the older group tended to have forgotten factual information they learned during the training sessions (Echt, Morrell, & Park, 1998)
- beginners' perceived self-efficacy tended to improve, while additional training for those who already had a certain level of DL skills did not lead to improvement (Wong, Chen, Lee, Fung, & Law, 2014)

=>acquisition of DL skills is negatively associated with the age of the learner

Digital Literacy Training Session Overview

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- Set up a face-to-face session "The Personal Computer for Beginners" with one credit (2010)
- Offer at least once a year at each of 50 study centers all over Japan
- Initially taught by the fulltime faculty, then entrusted to local adjunct faculty + assistants
- Use common syllabus and common textbook (originally developed)
- 12-hour intensive session with hands-on training
- Measure student DL skills using pretest and posttest in-class checklist to asess learning outcomes

Digital Literacy Training Session Common Syllabus

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This hands-on training session is for students to learn to use a PC for the first time. It includes learning how to use the keyboard and mouse, how to find information on the Internet, how to use e-mail, how to use Word to write assignments, and how to manipulate PowerPoint to create a presentation with tables and figures. Students will be able to access broadcast television and radio courses online, learn to access Wakaba for course registration and examination results, and to utilize Digital Library Services.

Digital Literacy Training Session Learning Goals

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- improve students' PC and Internet (Web) skills.
- prepare students to take online courses, and
- facilitate students' use of online course registration and administrative procedures.

Digital Literacy Training Session Contents

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	Lecture title	Description of lecture
Lecture 1	How to use PC (keyboard & mouse)	How to manipulate PC and mouse to input data
Lecture 2	Introduction to WORD	Basic operation of word processing software using Word
Lecture 3	Web and e-mail	How to use browsers, Web search engines and e-mail
Lecture 4	Security and etiquette	Knowledge on security and etiquette required for using PC
Lecture 5	Wakaba and library service	How to use the student information system Wakaba and library online services
Lecture 6	Advanced use of Word	Functions of word processing software for writing reports and essays
Lecture 7	Presentation	Preparation of presentation materials and classroom presentation using PowerPoint
Lecture 8	Guide to further study	Access to television and radio courses on PC, Web-based learning system, and OUJ self-learning site

Digital Literacy Training Session Cheklist (20 learning goals)

Likert scale (5 points)

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Item	Learning goals	Item	Learning goals
1	Boot, log on, and log off study center PC	11	Answer Web-based trial exam questions
2	Input Japanese letters using Word	12	Check out books using OUJ's Online Public Access Catalog
3	Run application software	13	Counteract computer viruses
4	Access OUJ Website	14	Explain etiquette for using the Internet
5	Search for information using search engine	15	Compose a simple essay using Word
6	Exchange e-mails using OUJ account	16	Write and print out own documents
7	Change own password at OUJ	17	Copy, save, delete, and move files
8	Access OUJ courses on the Internet	18	Create 5–6 slides using PowerPoint
9	Send questions on the OUJ Q&A site	19	Perform presentation using PowerPoint
10	Track own records on Wakaba	20	Use online self-learning site

approved by the OUJ Research Ethics Review Board

Purpose of the Study

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- identify how students migrated from one cluster to another by attending DLT session, using their self-reported perceived digital literacy skills

Method

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Ask students to fill the checklist at two points:

- Before starting the session (pre-session)
- After finishing the session (post-session)

Data analysis

- Develop a vector of 20 dimensions based on each student's perceived level of ICT skills reported in pre- and post-session checklists as a student characteristic.
- Perform k-means clustering (Hartigan-Wong)
- Compare pre-session cluster and post-session cluster
- Generate Sankey diagram to visualize migration
- Develop a co-occurrence network of post-session free-response comments

only data from checklists that were fully completed were used in the analysis.

Method: Data Colected

Semester	Number of Student
2nd, 2014	256
1st , 2015	342
2nd , 2015	224
1st, 2016	388
2nd, 2017	207
Total	1417

Almost 1,000 students took this session every semester. But only 1417 students in total filled all twenty items of both pre and post session checklists

Results: Explained variance

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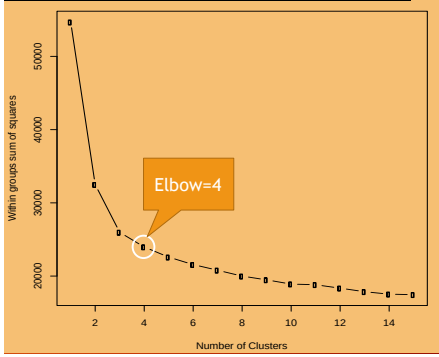

Results: Number of students classified in pre-session and post session clusters

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Cluster (pre)	Number of students	Cluster (post)	Number of students
A	201	X	483
B	300	Y	518
C	457	Z	303
D	450	W	113

Results: Pre-session clustering results

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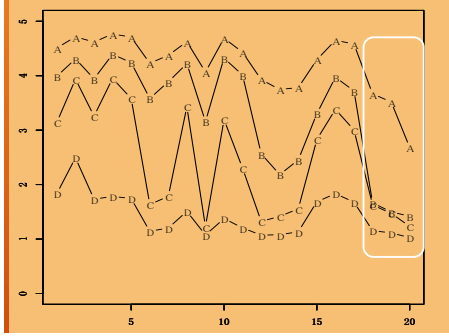

Results:
Pre-cource clustering results

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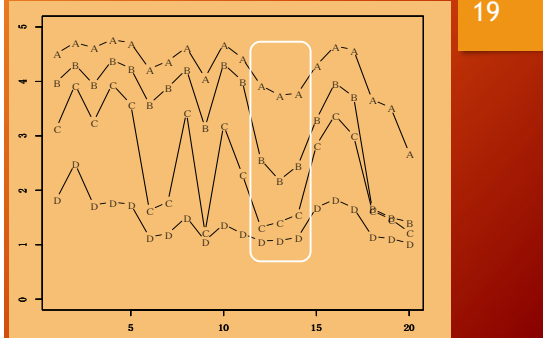

Results:
Pre-session clustering results

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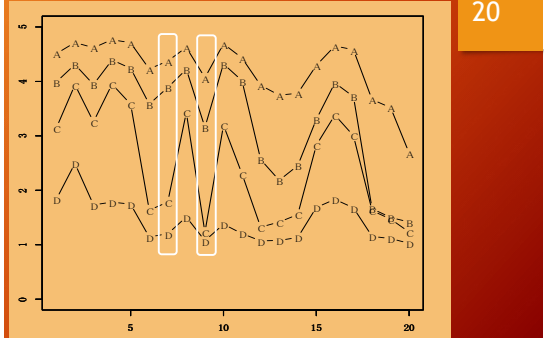

Results:
Post-session clustering results

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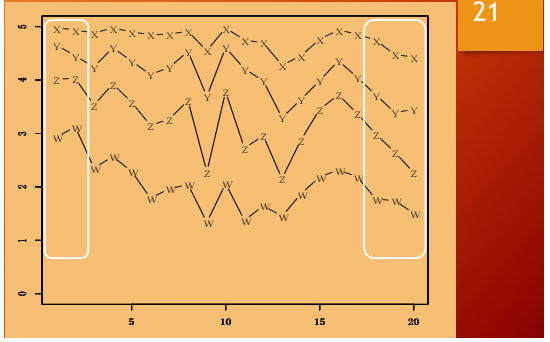

Results:
Post-session clustering results

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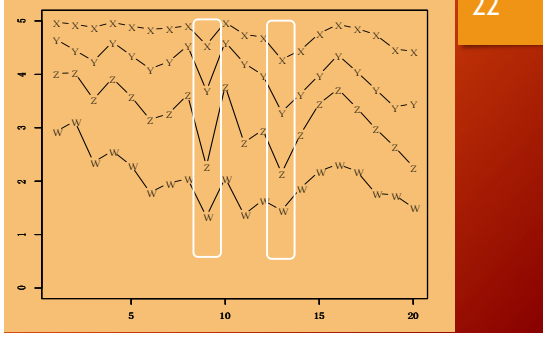

Results:
Migration of clusters from pre-session to post-session (Sankey diagram)

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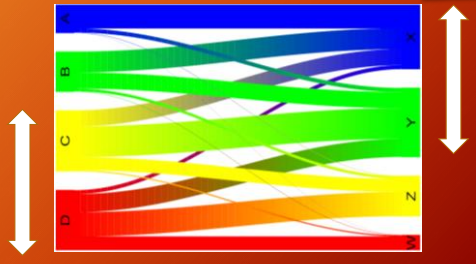

Results:
Number of students migrated

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Pre \ Post		X	Y	Z	W	total
A	number	177	31	2	0	210
	mean age	(40.8)	(44.0)	(48.0)	(-)	
B	number	156	121	21	2	300
	mean age	(43.1)	(48.1)	(48.6)	(51.5)	
C	number	120	230	98	9	457
	mean age	(46.5)	(50.5)	(55.6)	(60.4)	
D	number	30	136	182	102	450
	mean age	(51.1)	(55.2)	(60.1)	(63.5)	
Total		483	518	303	113	1,417

Results: Co-occurrence network of post-session free-response comments (n=108) Jaccard similarity coefficient ≥0.23

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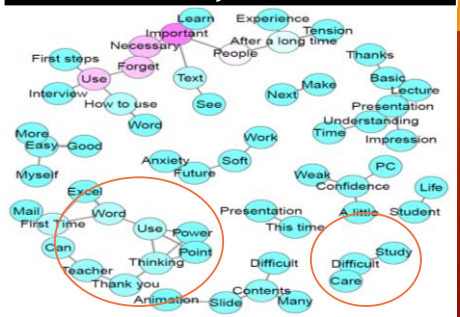

Reflections

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- The study result has been reflected on the renewed version of the DLT session.
- We also initiate creating study group of students in each study enter to encourage peer learning.

<=learning program for the elderly be strongly facilitated by peer support (Naumanen and Tukiain, 2010)

Conclusion

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- We analyzed responses from 1,417 students who submitted checklists between Semester 2, 2014 and Semester 2, 2016 and completed all 20 items on both the pre- and post-session ability, based on each student's reported DL skill levels on the 20 checklist dimensions, using k-means with the Hartigan–Wong algorithm.
- We also analyzed how each of the pre-session clusters shifted to post-session clusters using a Sankey diagram.
- In addition, we analyzed students' post-session checklist comments on DLT using a co-occurrence network method.
- The DLT session had some educational effects.
- some of the older novice students did not learn enough to be able to manipulate the PC by themselves.

Question?

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```
install.packages("riverplot")

library(riverplot)
nodes <- data.frame( ID = c("A", "B", "C","D","X", "Y", "Z","W"),
x= c( 1, 1,1,1, 2,2,2,2 ),
col= c("#ff0000", "#ffff00","#00ff00","#0000ff","#ff0000",
"#ffff00","#00ff00","#0000ff"),
labels= c( "D", "C", "B","A","W", "Z", "Y","X" ),
stringsAsFactors= FALSE )
edges <- data.frame( N1 = c("A", "A","A", "A","B", "B","B",
"B","C","C","C","C","D","D","D","D"),
N2 = c("X", "Y","Z", "W","X", "Y","Z", "W","X", "Y","Z", "W","X", "Y","Z", "W"),
Value = c(
102,182,136,30,
9,98,230,120,
2,21,121,156,
0,2,31,177))
r <- makeRiver( nodes, edges )
plot( r )
```