

Learning Analyticsの概況と 最新動向の紹介

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2015-7-29 @明治大学

自己紹介

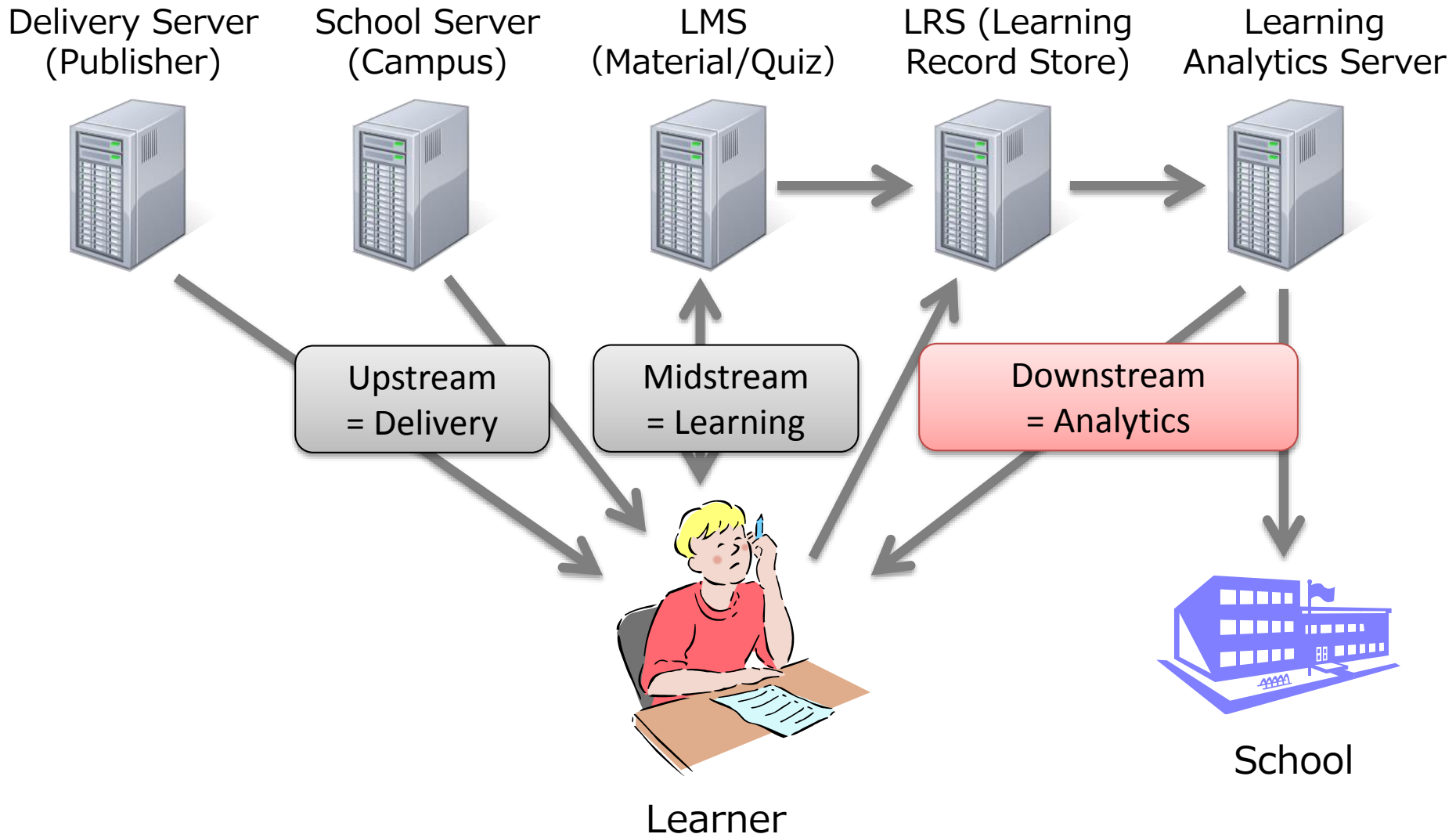
- 上智大学 理工学部 教授
 - 専門：教育工学、eラーニング、電子教科書
- 学習分析学会 理事長
- 日本eラーニング学会 副会長
- Asuka Academy 理事
- ICT Connect 21 技術標準化WG 座長
- ISO/IEC JTC1/SC36 (e-Learning)
 - WG8 (Learning Analytics Interoperability) Co-leader
- IDPF/W3C/IMS EDUPUB Project member
- 総務省 先導的教育システム実証事業 評価委員
- 文部科学省 デジタル教材等の標準化に関する企画開発委員会 第一分科会委員
- JEPA (日本電子出版協会) フェロー

Learning Analyticsの定義

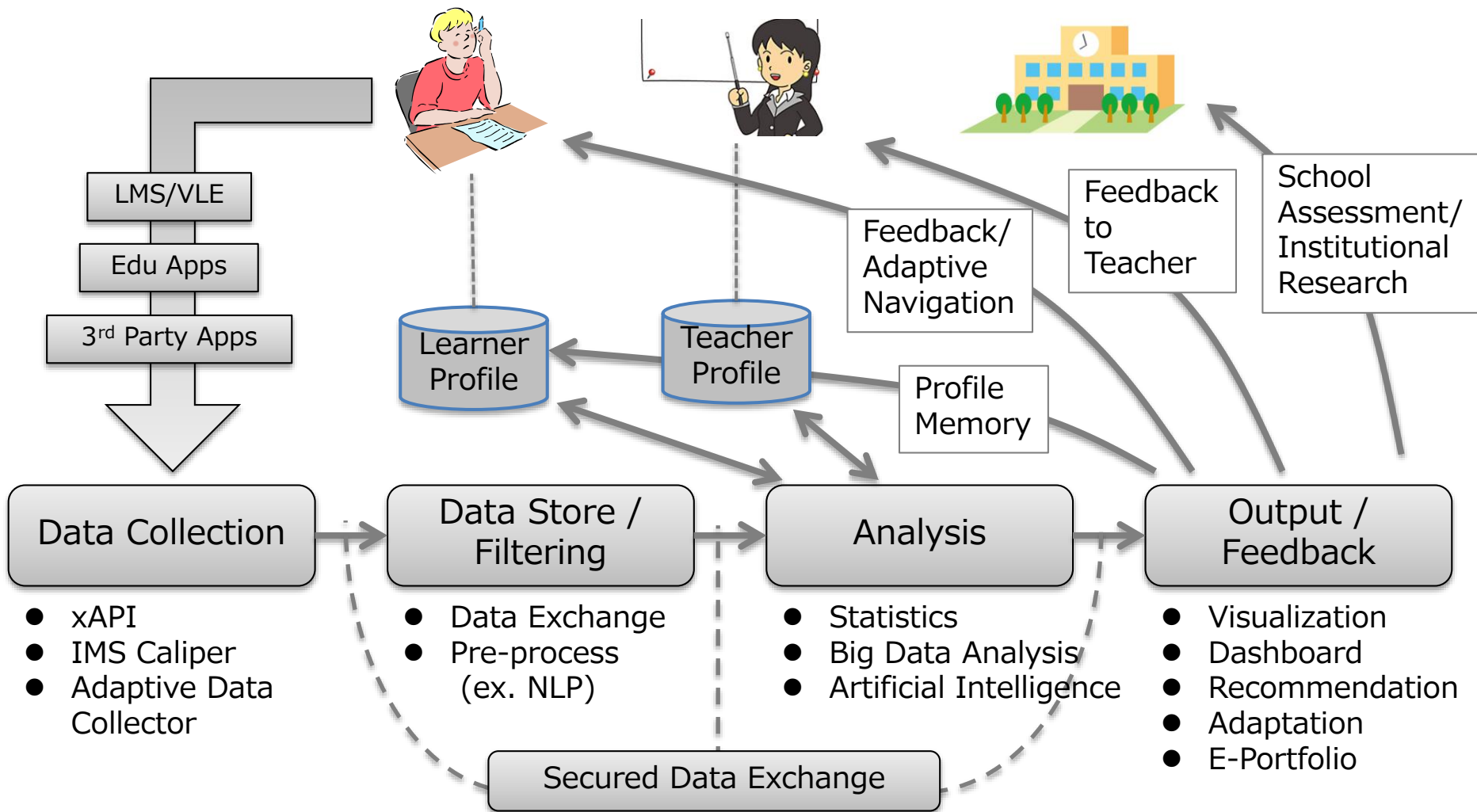
“Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs. ”

Ferguson, R. (2012). Learning analytics: drivers, developments and challenges. *International Journal of Technology Enhanced Learning*, 4(5-6), 304-317. (LAK 2011)

教育の情報化におけるLAの位置付け

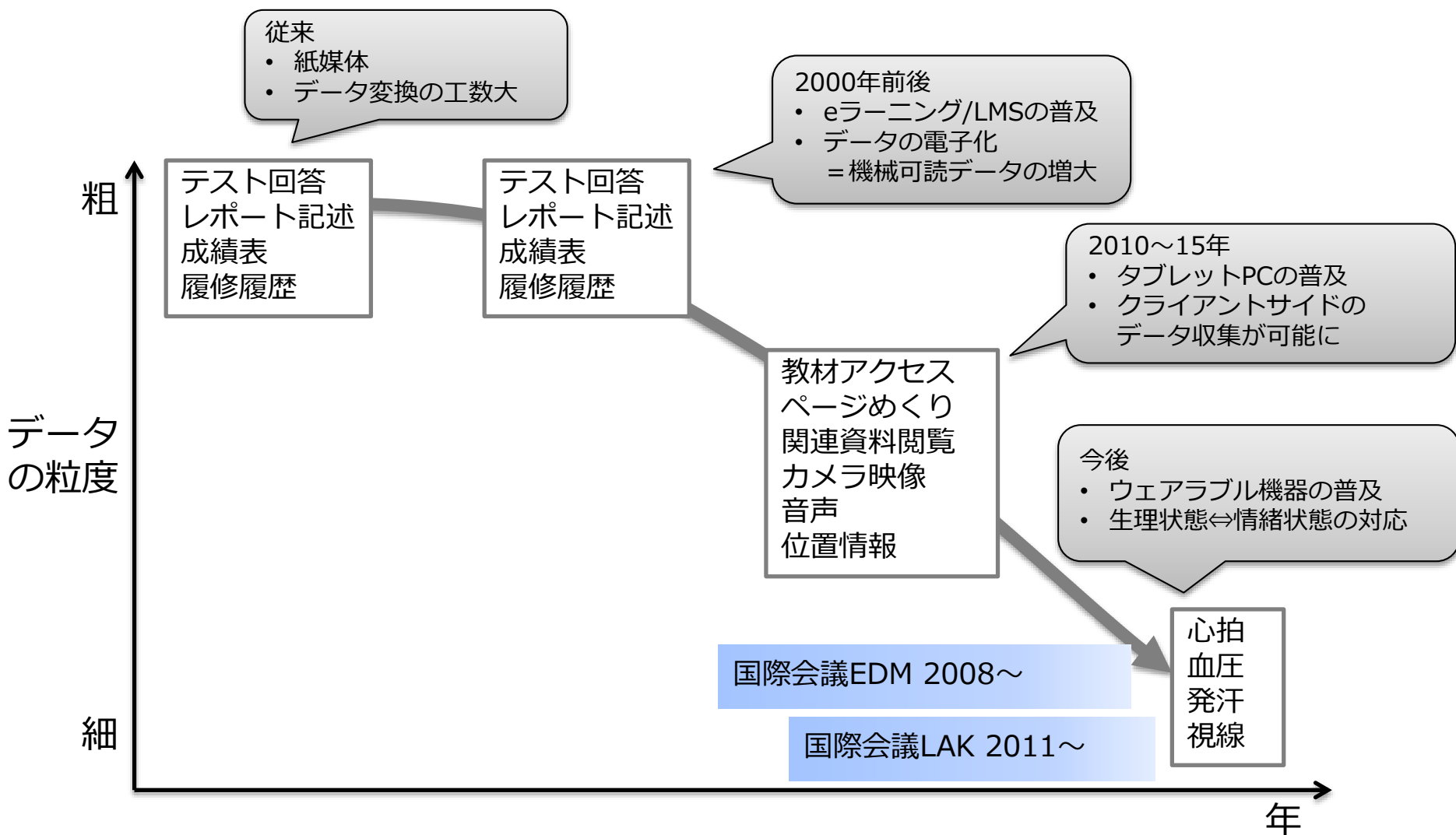


LA Overview

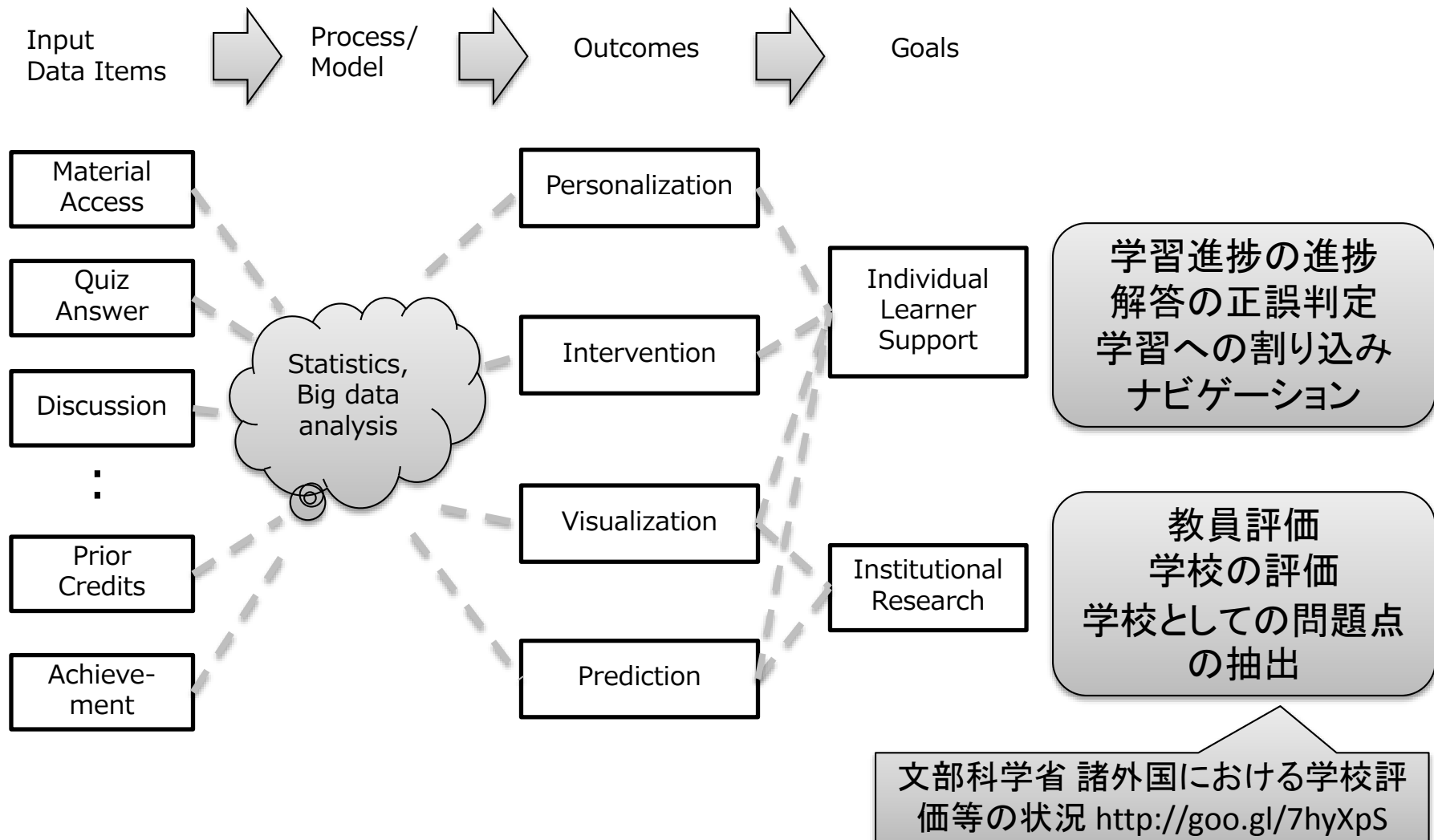


Revised from ISO/IEC TR20748-1 Learning Analytics Interoperability: Reference Model

学習履歴データの電子化と細粒度化



Learning Analyticsの入力と出力



先行研究におけるLAの入力⇔出力の例

Table 1. Data items and Objectives of Learning Analytics Researches (classroom and individual learning).

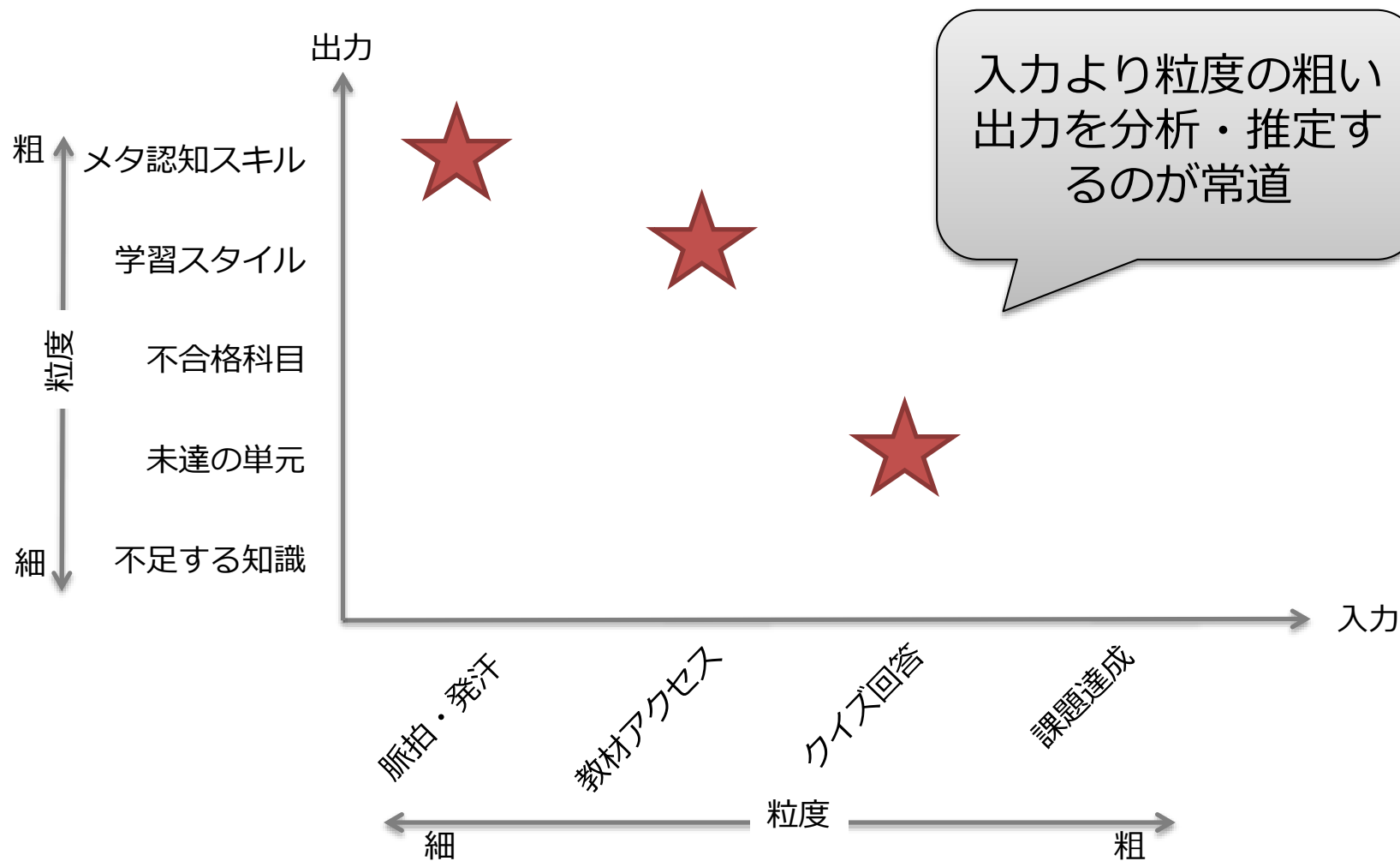
Reference	Data Items	Goal of Analysis
Arnold and Pistilli (2012)	Posting of a traffic signal indicator on a student's LMS home page, E-mail messages or reminders, Text messages, Referral to academic advisor or academic resource center, Face to face meetings with the instructor	Relationship between items and achievement
Barber and Sharkey (2012)	Prior credits earned, Discussion post count/week, Late assignments, Orientation participation, Count of messages to instructor, Inactive time since last course	Prediction of class achievement
Clow (2013)	Visit, Registration, and contribution ratio of MOOCs	Drop rate analysis of MOOCs learners
Graf et al. (2011)	Templates, patterns, learning object, database connections of materials	Judgment of material difficulty
Holman et al. (2013)	Grade, Class standing, and badges of quizzes	Self prediction of achievement
Kizilcec et al. (2013)	Visiting, Enrollment, and assessment numbers in MOOCs courses	Number transition of MOOCs learners
Lonn et al. (2012)	Grade information every few weeks	Assistance necessity from mentors
Martin et al. (2013)	Answers of each sub-quiz	Visualization of learning process
Monroy et al. (2013)	Teacher's usage of teaching unit parts (overview, essentials, engage, explore, explain, evaluate, intervention, acceleration)	Heat map of unit parts usage
Niemann et al. (2012)	Learning object usage in a web portal	Similarity of learning objects
Pardos et al. (2013)	Quizzes and scaffolding help	Relationship between Scaffolding help and achievement
Raca and Dillenbourg (2013)	Video captured actions of learners	Learner behavior during classrooms
Santos et al. (2012)	Date and time range of learners	Visualization of learning status
Sao Pedro et al. (2012)	Quiz answers	Transition of problem solving skills
Tempelaar et al. (2013)	Achievements in various learning areas	Skill analysis (Self-belief, learning focus, planning, management, persistence)
Verbert and Duval (2011)	Dataset and functions of recommender system	Comparison of Recommender systems
Wolff and Zdrahal (2013)	Precision and recall of learning units	Comparison of TMA (Tutor-marked assessment) and VLE (Virtual learning environment)

Table 2. Data items and Objectives of Learning Analytics Researches (Collaborative and active learning).

Reference	Data Items	Goal of Analysis
Ahn (2013)	Emails received, Emails sent, Friends, Friend Lists, Links, Member pages, Networks, Notes, Photos, Status messages, Videos, Wall posts	Factor analysis of media literacy (Negotiation, Networking, Judgment, Play, Multitasking, Appropriation, Transmedia navigation)
Cambridge and Perez-Lopez (2012)	Discussion post, blog, their narratives,	Analysis of discourse style to activate learner groups
Camilleri et al. (2013)	Plauses and numbers of utterances in virtual space	Behavior analysis
Cobo et al. (2012)	Reading and writing activities during online discussions	Clustering of learners
Ferguson and Shum (2011)	Keywords in text chat	Chat type (evaluation, explanation, reasoning, justification, perspective)
Koulocheri and Xenos (2013)	Bookmarks, blog posts, topics and files uploaded, bookmarks, comments on bookmarks/blog posts/topics/files in group	Visualization of member relationships
De Liddo et al. (2011)	Response type of utterances (respond, about, example, solution, support)	Relationship analysis of learners
Schneider et al. (2013)	Eye-tracking data	Estimation of collaborative learning skills
Schreurs et al. (2013)	Person, type of tie, topic	Visualization of learner relationship network
Shum and Crick (2012)	Quiz achievement and various activities	Relationship between individual learning achievement and meta-skills
Siadaty et al. (2012)	Vocabulary in shared Wiki and bookmark	Collaborative skills analysis of corporate learners
Suthers and Rosen (2011)	Chat, Discussion, File sharing	Multiple level visualization (Process, Domain, Event, Action, Mediation, Relationship, Tie)
Tempelaar et al. (2013)	Achievements in various learning areas	Analysis of necessary skills (Self-belief, learning focus, planning, management, persistence)

Tamura, Y., [Learning Analytics Data Items on Digital Textbooks](#), 1st ICCE Workshop on Learning Analytics (LA2014), 2014-12-1, Nara Japan.

LA研究マップの例



研究開発の現状

- 研究
 - 専門の国際会議が発足して数年
 - 徐々に知見が蓄積されつつある
 - 学習支援等の実務に適用可能なフレームワーク構築はこれから
- 開発
 - データ取得：デバイスやツールは揃いつつある
 - データ解析：ビッグデータ解析、統計：Ready!
 - 学習支援等に有効な結果は・・・なに？
 - 教育・学習の視点からの考察・議論が不足

LAに関する情報源

- International Conferences
 - LAK: Learning Analytics and Knowledge
[2011](#), [2012](#), [2013](#), [2014](#), [2015](#)
 - EDM: Educational Data Mining
[2008](#), [2009](#), [2010](#), [2011](#), [2012](#), [2013](#), [2014](#), [2015](#)
- [Journal of Learning Analytics](#)
- [Google groups on learning analytics](#)
- [LACE Project](#) (Europe)
- ISO/IEC JTC1/SC36 (Learning Technology) WG8
 - 2015年6月発足
- [学習分析学会](#)
 - 2015年5月発足

ISO/IEC JTC1/SC36 WG8 について

- SC36
 - Information Technology for Learning, Education and Training (ITLET)
 - 1999年発足、2000年初会合 (London)
- 2015年6月 WG8 (Learning Analytics) が発足
 - Convener(議長) : Yong-Sang Cho (KERIS)
 - ISO/IEC TR 20748
 - WG8/N0010: Reference Model
 - WG8/N0011: System Requirements
 - Study Group
 - Systems governance for learning analytics
 - Data framework for learning analytics interoperability

学習分析学会

- NPO法人 人材育成マネジメント研究会を改組
 - 2015年5月総会で承認、発足
 - <http://jasla.jp/> (8月公開)
- 目的：LAに関する研究・開発・啓蒙・情報交換
- 今後の予定
 - 2015年9月1日：発足記念パーティ
 - 2015年10月24日：第1回研究会 (浜松)
 - 2015年10月29日：LAハッカソン (御茶ノ水)
 - 2016年3月：第2回研究会 (TBA)

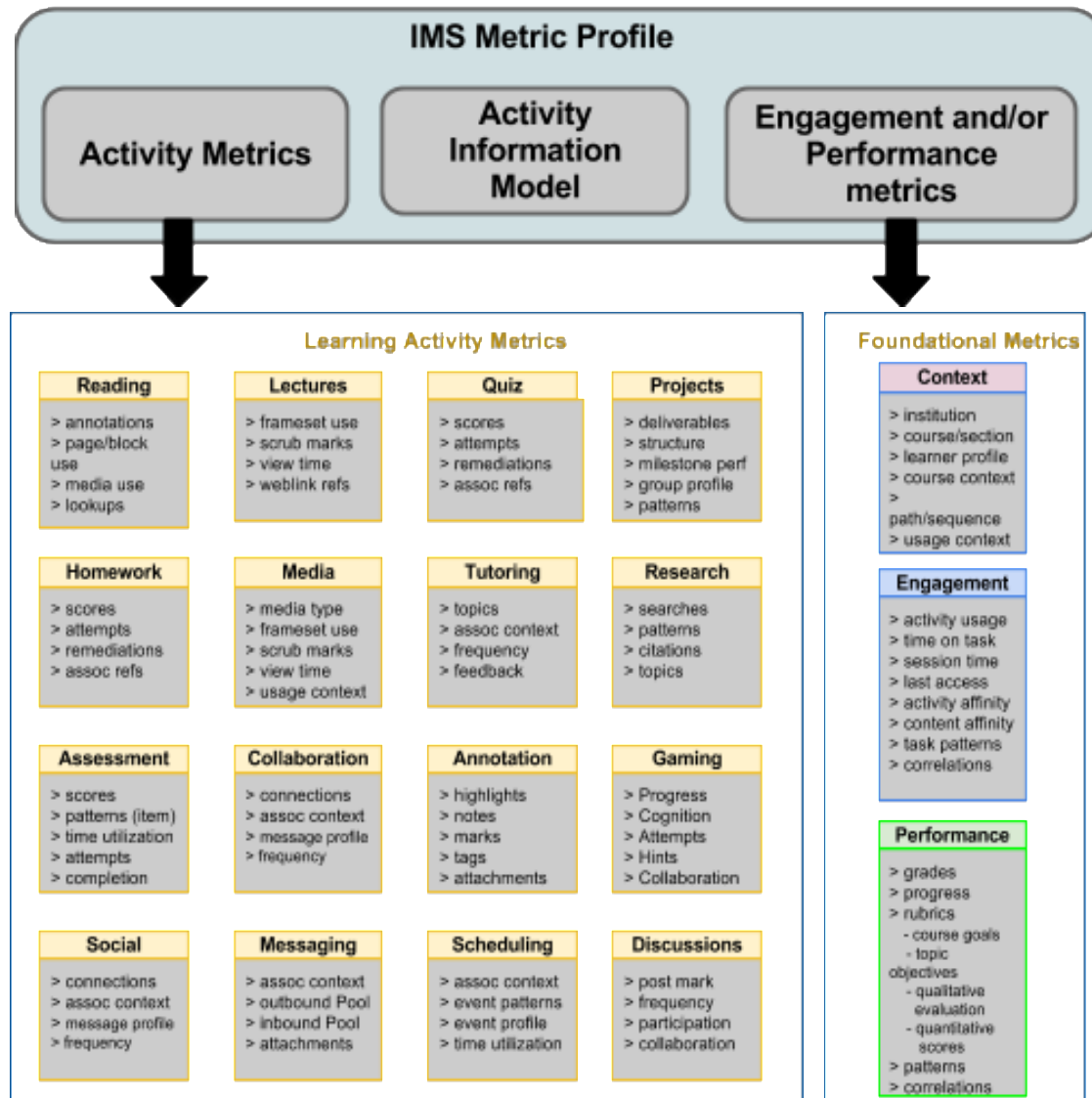
EL Award Forum LAハッカソン

- [e-Learning Award 2015 Forum](#),
学習分析学会 共催
- 10月29日 東京・御茶ノ水 ソラシティ
- 通常のハッカソン：企画→プログラム開発
- LAハッカソン：企画→データ分析
 - データからどんな傾向が読み取れるか（前向き）
 - これを推定するにはどんなデータが必要か（後ろ向き）
- 事前にメンバー募集、チーム編成、予備データ分析
- 当日結果発表、審査、表彰
- 詳細は学習分析学会HPにて近日公開

各種規格で提案中のLAデータ項目

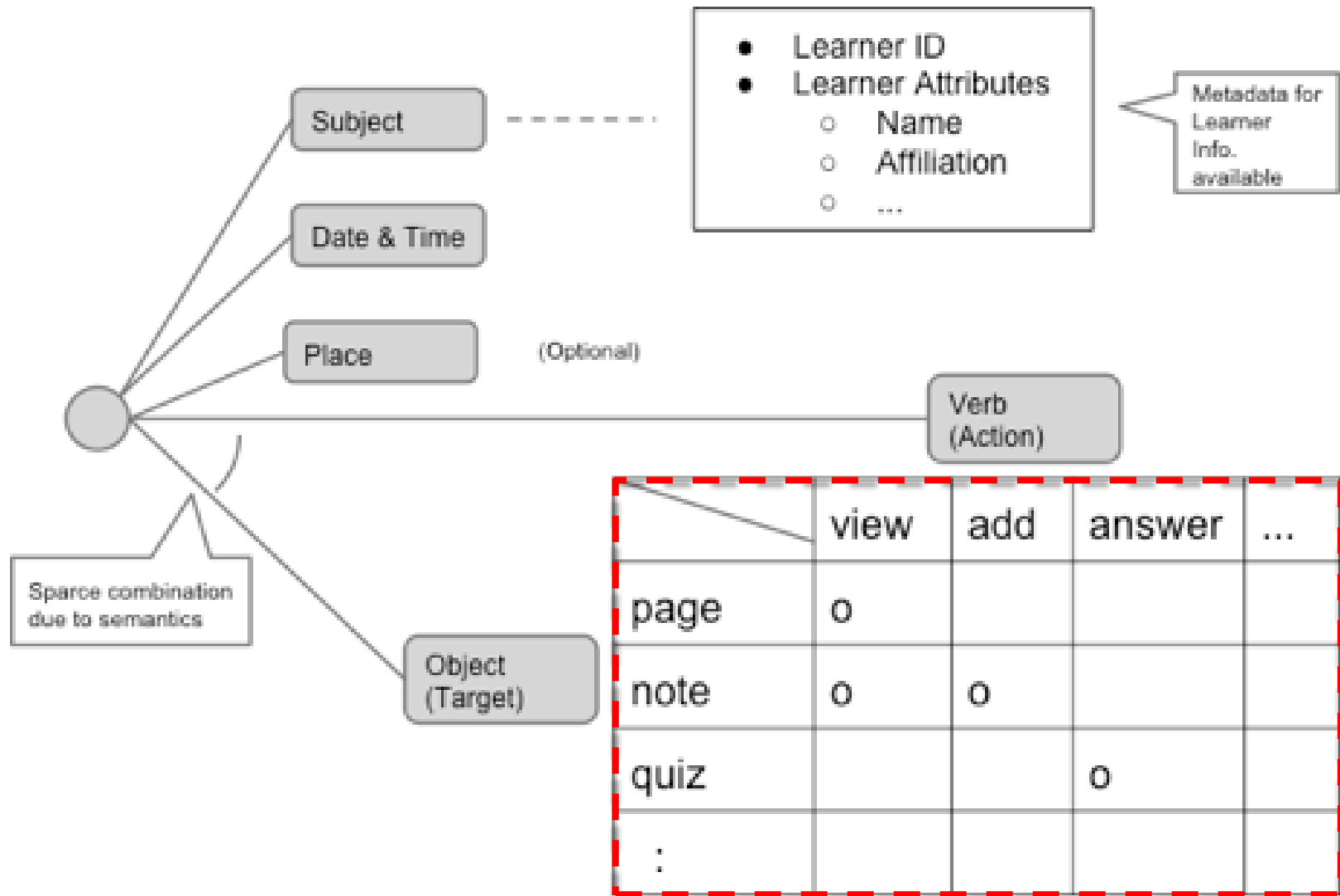
- IMS Caliper
 - 69+23項目の例
 - 学習指導要領 (US) との関連づけ
- 文科省・電通
 - 現在検討中、非公開
 - 現状60項目
- EDUPUB LA
 - 44項目
 - ADL xAPIに近い記述

IMS Caliper Analytics



参照: IMS GLC,
 Learning Measurement
 for Analytics Whitepaper,
<http://goo.gl/5ISNVy>

EDUPUB LA: Data Structure



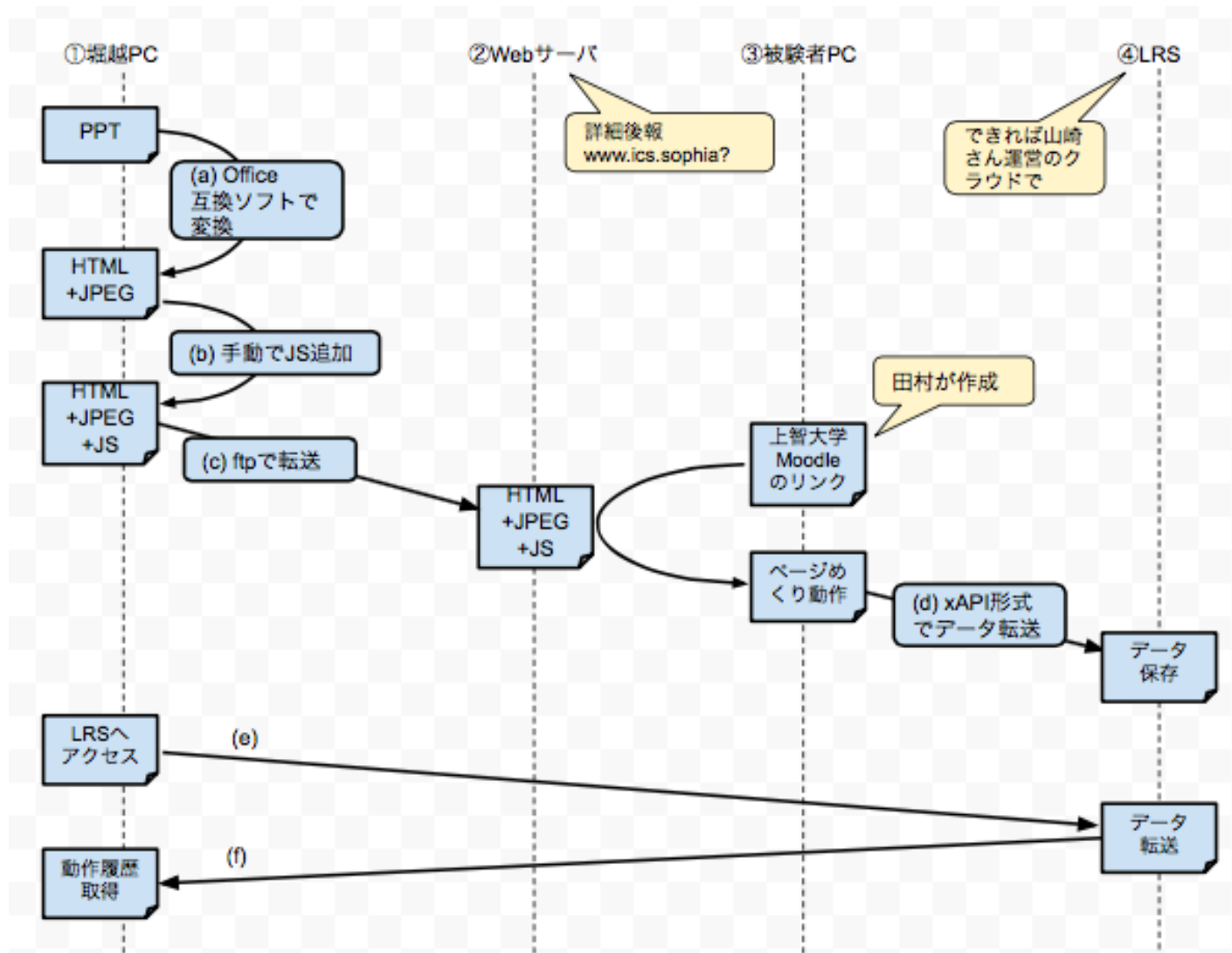
EDUPUB LA: Verbs and Objects

Category	Verb (action) / Object (target)	attend/ quit	flip/view	add	modify	delete	answer	send	receive
classroom and individual learning	class	o							
	page of e-textbook or reference		o						
	highlight / underline			o	o	o			
	note (annotation)		o	o	o	o			
	reference / dictionary		o						
	link		o	o	o	o			
	quiz		o				o		
	assignment		o					o	o
	feedback		o				o		
	message							o	o
hint / advise								o	
collaborative and active learning	group	o							
	text message		o					o	o
	audio message		o					o	o
	video message		o					o	o
	shared whiteboard		o	o	o	o			
shared file		o	o	o	o		o	o	

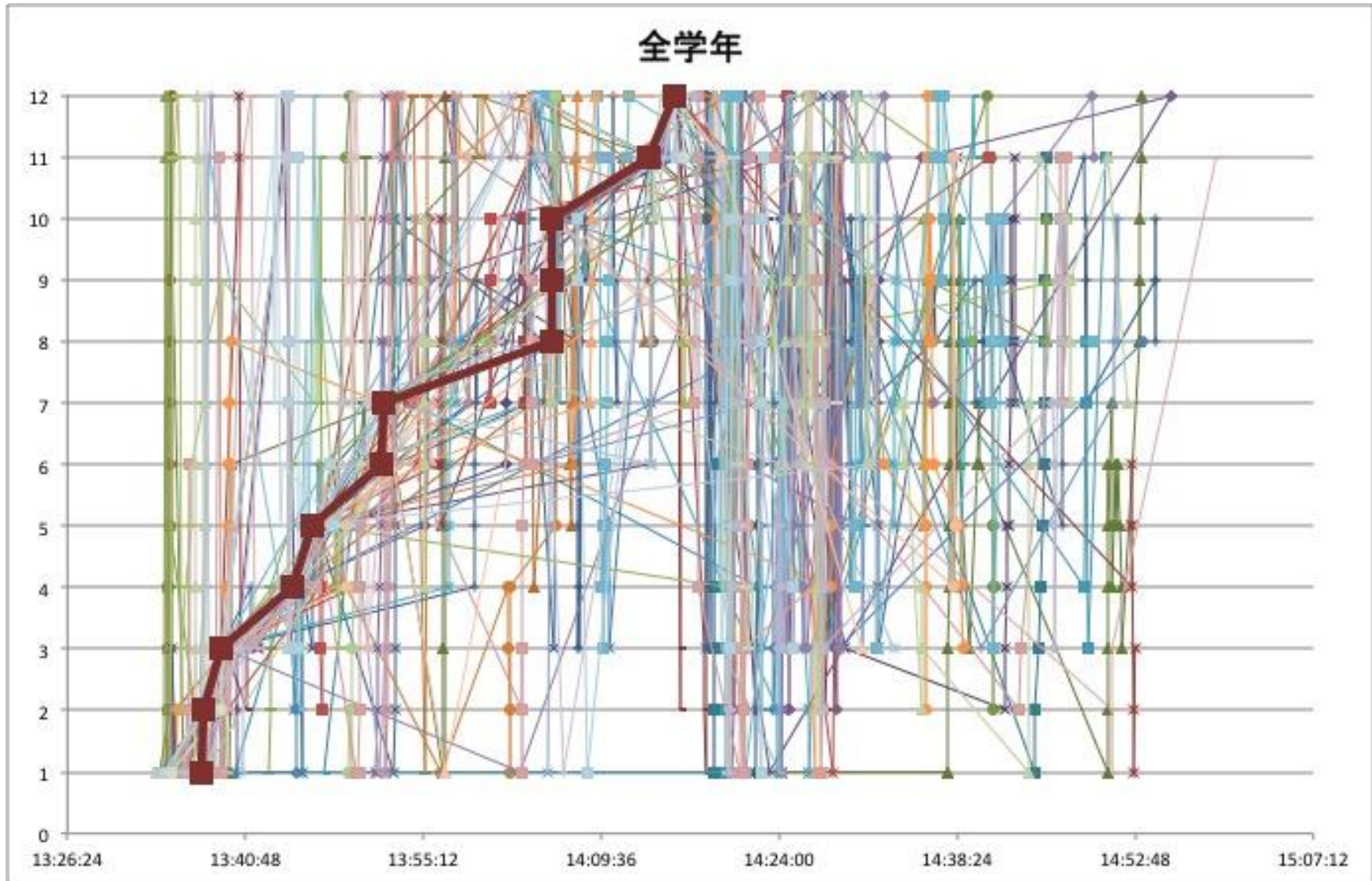
田村研究室でのLAの試み

- EPUBリーダー (Readium)へのページめくり履歴取得機能追加 (渡辺)
 - Tamura, Watanabe, Page Flip Acquisition on EPUB e-Textbook for Learning Analytics, Proc. KES 2015 (to be appeared 2015.9)
- 心拍測定による情緒状態の推定とフィードバック (村上)
 - Tamura, Murakami, Heart Rate Feedback for Learners' Emotional Self Control, Proc. MAC-ETEL 2015 (to be appeared 2015.8)
- ページめくり履歴による学習スタイルの推定 (堀越・山崎)
 - IEICE ET研究会(大分) 発表予定 (2015.10)
 - ICCE 2015 Workshop(杭州) 発表予定 (2015.11)

ページめくり履歴の取得

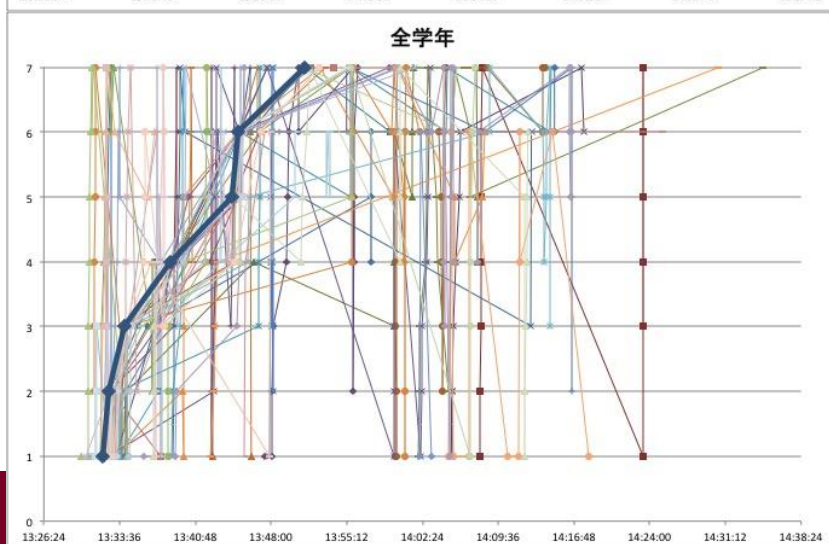
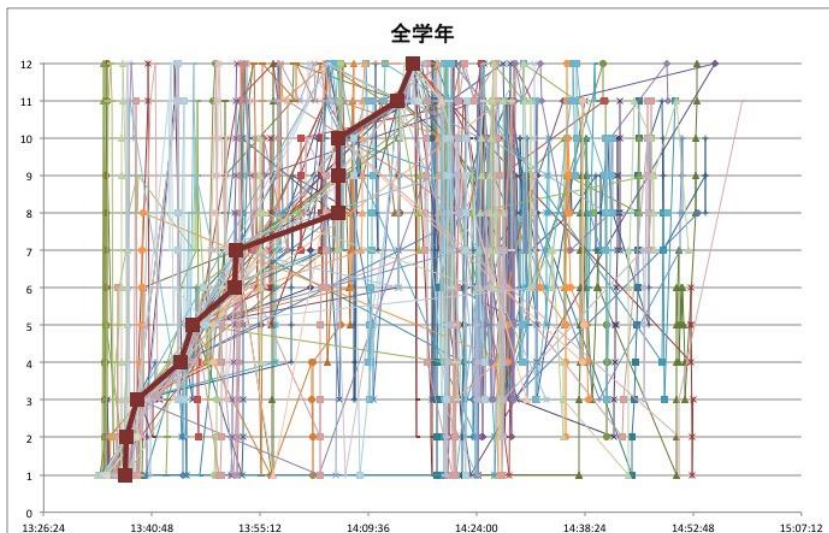


ページ遷移 (太線：教員)

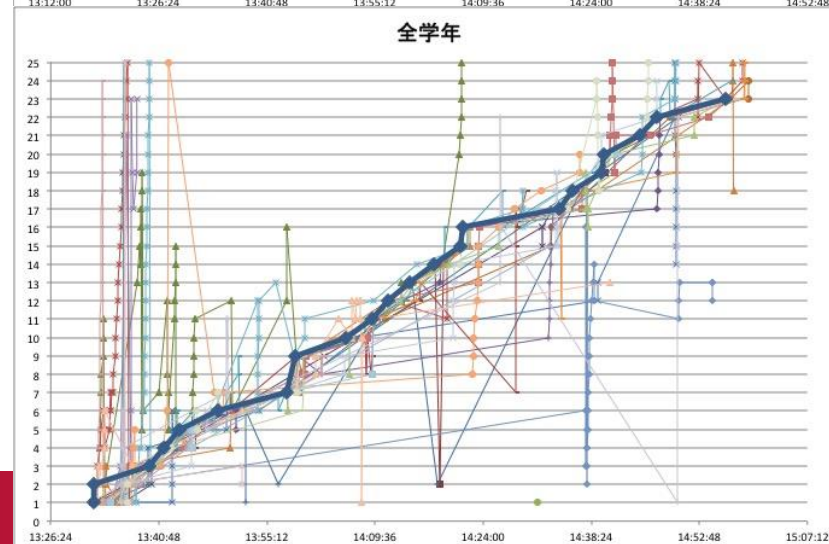
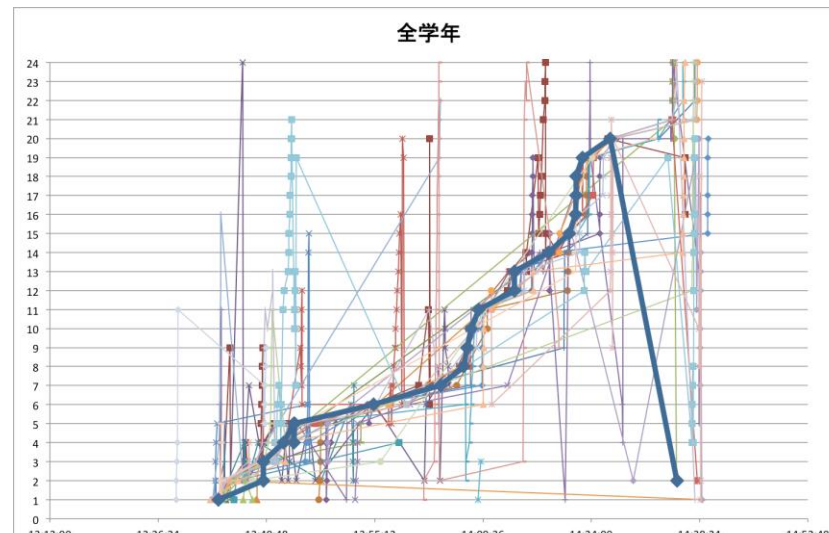


ページ遷移の科目間比較

- 情報リテラシー

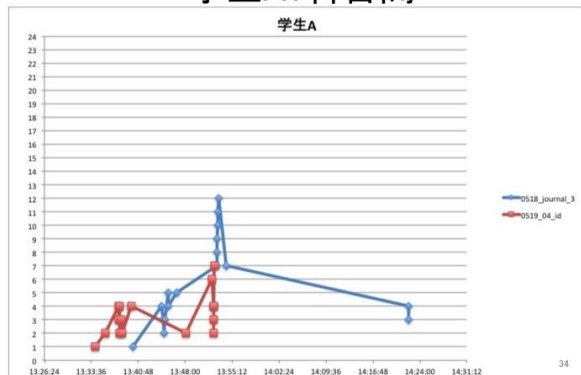


- 教育情報工学

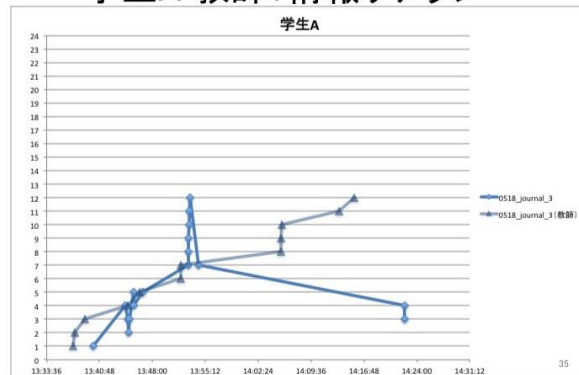


同一学生、異なる科目の比較

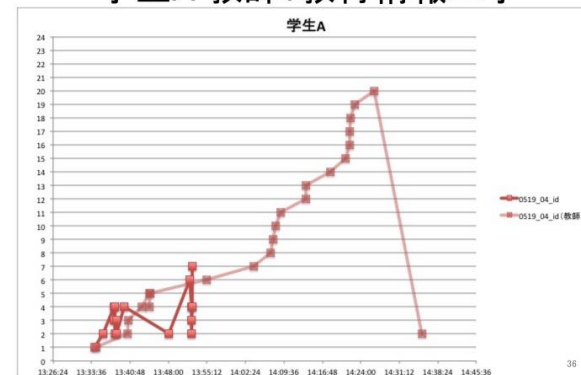
学生A: 科目間



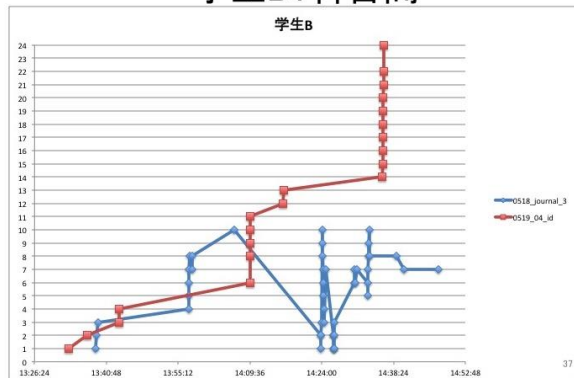
学生A-教師: 情報リテラシー



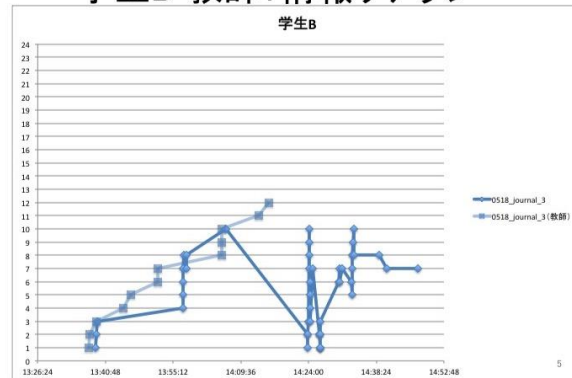
学生A-教師: 教育情報工学



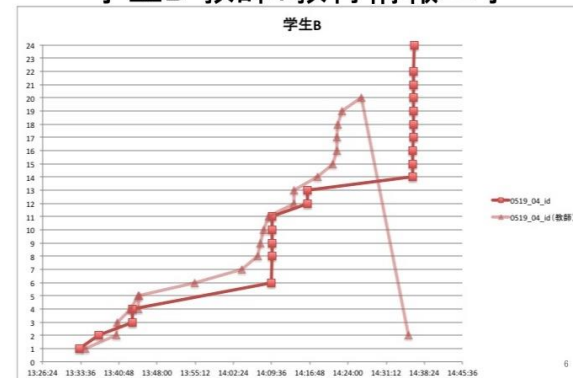
学生B: 科目間



学生B-教師: 情報リテラシー



学生B-教師: 教育情報工学



ご静聴ありがとうございました