Bible Online Learner and other applications

II: Text models, data structures and _applications_

Data models are implemented in **applications,** applying text models.

Nicolai Winther-Nielsen
GLI, ETCBC, FIUC-DK
Lorenz Workshop
February 18 2020
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Global Learning Initiative
SUPPORTING OPEN BIBLE-DRIVEN LEARNER-DIRECTED EDUCATION

OUTLINE

Outline

1. A Corpus-application: Bible Online Learner

2. Design for learning: *My Biblical Hebrew*

3. Development

    1. Applications: past, present and future

        1. Bible OL (w. Claus Tøndering)

        2. Role Lexical Module (w. Chris Wilsen)

        3. RRG-BH (w. Christian Canu Højgaard)

    2. Exam module: Oliver Glanz (5 min)

    3. DaDEL: Ernst Boogert (5 min)

NIAS
Lorentz center
Workshop @Snellius

Processing Ancient Text Corpora
17 - 21 February 2020, Leiden, the Netherlands

Scientific Organizers
- Cody Kingham, University of Cambridge
- Wido van Peursen, VU Amsterdam
- Dirk Roorda, DANS-KNAW
- Nicolai Winther-Nielsen, FIUC-DK

Topics
- Linguistic research
- Ancient languages
  (esp. Ancient Hebrew, Syriac, Arabic)
- Machine Learning
- Educational Tools

1. BIBLE ONLINE LEARNER

- How if you turn a corpus around
  from   searching for patterns
              & production of data
  to   *practice for learning*… ?
- Bible Online Learner
  https://bibleol.3bmoodle.dk/

Corpus-driven learning
- Persuasive learning: fun, effective and efficient
- Self-correcting: instant feedback
- Assessment: performance-tracking

What Is Bible Online Learner?

Bible Online Learner (Bible OL) gives free access to the Hebrew Bible in the ETCBC4 database and Nestle's 1904 text of the Greek New Testament with grammatical annotations; furthermore, teachers can use exercises developed for Bible OL or create their own.

Bible OL is interlinked with the award-winning Hebrew query and text display site SHEBANQ. From a chapter in Bible OL, click the SHEBANQ logo to jump directly to that chapter on their website. Furthermore, facilitators can use queries from SHEBANQ to generate exercises in Bible OL.

The source code for Bible OL is available at GitHub. We hope developers will fork this code and join us to add additional features.

Background

- 2008-:

  - Use ETCBC corpus (BHSA)

  - Open source

  - Teachers repurpose

- 2018-:

  Online and blended learning

12 years development
- PC Program   2008-2010
- EU project EuroPLOT 2010-2013
- Bible Online Learner 2013-

Projects
- Copenhagen   2008-
- Gothenburg   2010-2011
- Madagascar   2010-2015
- Andrews University 2015-
- DADeL   2018-2020
- *My Biblical Hebrew* 2018-

Framework
- Global Learning Initiative, 3BM
- ETCBC

ETCBC interface

- Grammar through the interface

Word

- ☐ Word spacing
- ☐ Transliteration

Form in text

- ☐ Lexical stem
- ☐ Root formation
- ☐ Preformative
- ☐ Verbal ending
- ☐ Nominal ending
- ☐ Pronominal suffix
- ☐ Univalent final
- ☐ Qere

Lexeme

- ☐ Lexeme (with variant)
- ☐ Lexeme (transliterated)
- ☐ Occurrences
- ☐ Frequency rank
- ☐ Part of speech
- ☐ Phrase dependent part of speech
- ☐ Lexical set
- ☐ Verb class
- ☐ Link

Morphology

- ☐ Stem
- ☐ Tense
- ☐ State
- ☐ Person, gender, number
- ☐ Suffix: Person, gender, number

Glosses

- ☐ Danish
- ☐ English
- ☐ German
- ☐ Dutch
- ☐ Spanish
- ☐ Amharic
- ☐ Swahili

- ▶ Word
- ▶ Phrase
- ▶ Clause
- ▶ Sentence

Phrase

- ☐ Separate lines
- ☐ Show border
- ☐ Type
- ☐ Function
- ☐ Determination
- ☐ Relation

Clause

- ☐ Separate lines
- ☐ Show border
- ☐ Type
- ☐ Kind
- ☐ Relation
- ☐ Text type
- ☐ Domain
- ☐ Indentation
- ☐ Linkage
- ☐ Syntactic code

Sentence

- ☐ Separate lines
- ☐ Show border

Interact with data

- Display text at
  https://bibleol.3
  bmoodle.dk/

Bible Online Learner

Home

Text and Exercises ▾

○ Hebrew (ETCBC4, OT)
○ Hebrew (ETCBC4, Transliterated, OT)
○ Greek (Nestle 1904, NT)

Book:

Genesis

Chapter:

1   (Valid chapters: 1-50)

First verse:

1

Last verse:
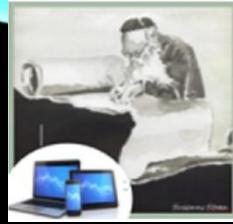
to Bible Online Learner

Interact with data
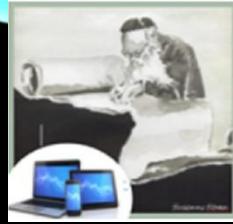
- Display text at https://bibleol.3bmoodle.dk/

Interact with data

- Display text at https://bibleol.3bmoodle.dk/

Word

Phrase

Clause

Sentence

Genesis 1

Phrase:Subj אֱלֹהִ֑ים

Phrase:Pred בָּרָ֣א

Phrase:Time בְּרֵאשִׁ֖ית [1]

Phrase:Objc אֵ֥ת הַשָּׁמַ֖יִם וְאֵ֥ת הָאָֽרֶץ׃

Interact with data

- In translitteration

Bible Online Learner

- ⦿ Hebrew (ETCBC4, OT)
- ◯ Hebrew (ETCBC4, Transliterated, OT)
- ◯ Greek (Nestle 1904, NT)

Genesis 1

Phrase:Time

¹bᵊ-   rēʾšît
in   beginning

Phrase:Pred

bārāʾ
create

Phrase:Subj

ʾᵉlōhîm
God

Phrase:Objc

ʾēt   ha-   ššāmayim   wᵊ-   ʾēt   hā-   ʾāreṣ:
<OM>   the   heaven   and   <OM>   the   earth

Interact with data

- In different languages

- English: Henrik Jan Bosma and Ferenc Postma: I, D (German: D)

- Danish: Claus Tøndering and Nicolai Winther-Nielsen: I

- Spanish: Oliver Glanz, Janet Dyk: I (D)

- Portuguese: Oliver Glanz: I (D)

- Dutch: Wido van Peursem.Ernst Boogert: I, D

- Amharic: Zetseat Fekadu: (I, D)

- Chinese: Esther Lam: I

- Swahili: David Instone-Brewer: D

Taal ▾

Dansk

Deutsch

English

Español

Français

Nederlands

Português

አማርኛ

中文（简体）

中文（繁體）

Translation of learner interface

Target language: Dutch ▾

Danish
English
German
Dutch
Spanish
Amharic
Swahili

Occurrences		eme	Stem	First occurrence	English ▾	Dutch
50273	W	וֹ	None	Gen 1:1	and; also, even (conj); but	en, ook, namelijk. ?combinaties?
30380		I הַ	None	Gen 1:1	the (art)	het, de (lidwoord)
20069	L	לְ	None	Gen 1:5	to, toward (prep); Do, Yes, (voc); in regard to, for	naar, tot, aan, op; [+ inf constr] om/door te
15541	B	בְּ	None	Gen 1:1	in, at (time, place); with; by; by means of	in, op, tegen, met, bij
11016	>T	I אֵת	None	Gen 1:1	<OM>; object marker	[nota objecti]

Interact with data

- Through added data
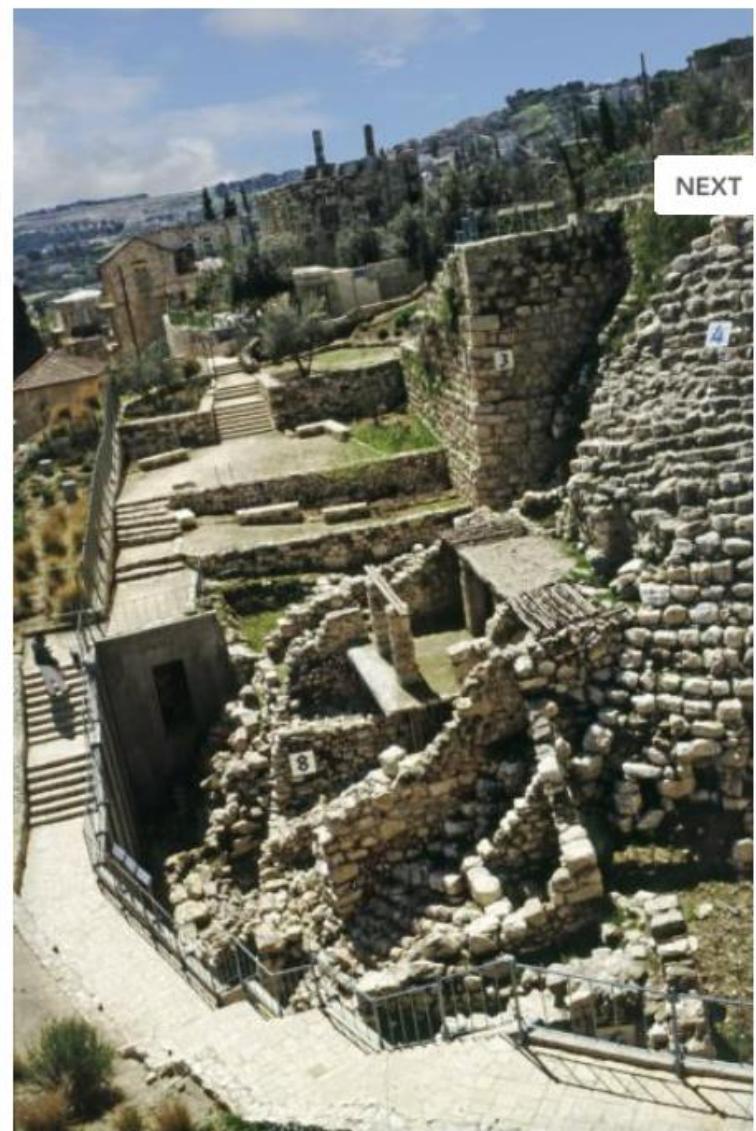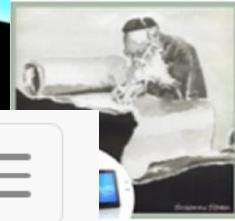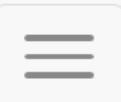
Practice

- Exercises
  - ➢ GLI

Bible Online Learner

☰

Home

Text and Exercises ▾

Display text

Exercises

My Data ▾

User Access ▾

🅰 Language ▾

Select a Quiz

Click on a folder to open it, or select the number of questions you want from a particular quiz and whether you want to use the preset passage selection or specify your own passages.

This Is the Folder 'GLI/Proficiency Tests/Proficiency Test 2-1 Basic 1'

Select a folder

↑ Parent

Select an Exercise

Quiz name	Select number of questions using preset passages			Select number of questions and specify your own passages		
📄 Proficiency 21_01: Vocab 202	5	10	25	5	10	25
📄 Proficiency 21_02: Nouns with suffixes	5	10	25	5	10	25
📄 Proficiency 21_03: Preposition with suffix	5	10	25	5	10	25
📄 Proficiency 21_04: Regular qal	5	10	25	5	10	25
📄 Proficiency 21_05: Regular and guttural in all stems	5	10	25	5	10	25
📄 Proficiency 21_06: Glosses 50+ in Gen 1:6-2:3	5	10	25	5	10	25
📄 TestMBH21_01: Vocab 202 50x	50					
📄 TestMBH21_02: Nouns with suffixes 100x	100					
📄 TestMBH21_03: Preposition with suffix 100x	100					
📄 TestMBH21_04: Regular qal 75x	75					
📄 TestMBH21_05: Regular and guttural all stems 50 x	50					
📄 TestMBH21_06: Glosses 50+ in Gen 1:6-2:3 100 +	100					

Select a Quiz

Click on a folder to open it, or select the number of questions you want from a particular quiz and whether you want to use the preset passage selection or specify your own passages.

Task 5: all stems for regular and guttural verbs - 100 questions

- Test skills in parsing the regular and guttural verb (Vocab 303)
- Default passages: Hebrew Bible
- Performance speed for questions per minute: low 11, high 15, elite 30

This test focuses on all regular and guttural verbs have changes in the consonants and are very frequent, occurring more than 240 times in the Hebrew Bible. Knowing these forms well will help you recognize irregular verbs much easier.
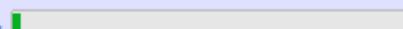
[First time user? Log in HERE and enroll
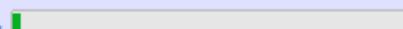
Cohortative
Emphatic imperative
Imperative
Infinitive absolute
Infinitive construct
Jussive
None
Participle
Passive participle
Qatal (Perf)
Wayyiqtol (weClmpf)
Yiqtol (Impf)

וּלְאִישׁ
יְהוָה אֶ
אַהֲרֹן בְּ
וַיֹּאמֶר
אָחִיךָ וְ
מִבֵּית כ
עַל־הָאָ

עֻם־טָמְאָה: פ וַיְדַבֵּר
מוֹת שְׁנֵי בְּנֵי
יְהוָה וַיָּמֻתוּ:
דַּבֵּר אֶל־אַהֲרֹן
עֵת אֶל־הַקֹּדֶשׁ
הַכַּפֹּרֶת אֲשֶׁר

Text	Hint	Stem		Person
דַּבֵּר	-			

Progress: ▮ 1/50

Check answer Show answer

Next GRADE task SAVE outcome

2. MY BIBLICAL HEBREW

- Design for learning in and with Bible OL
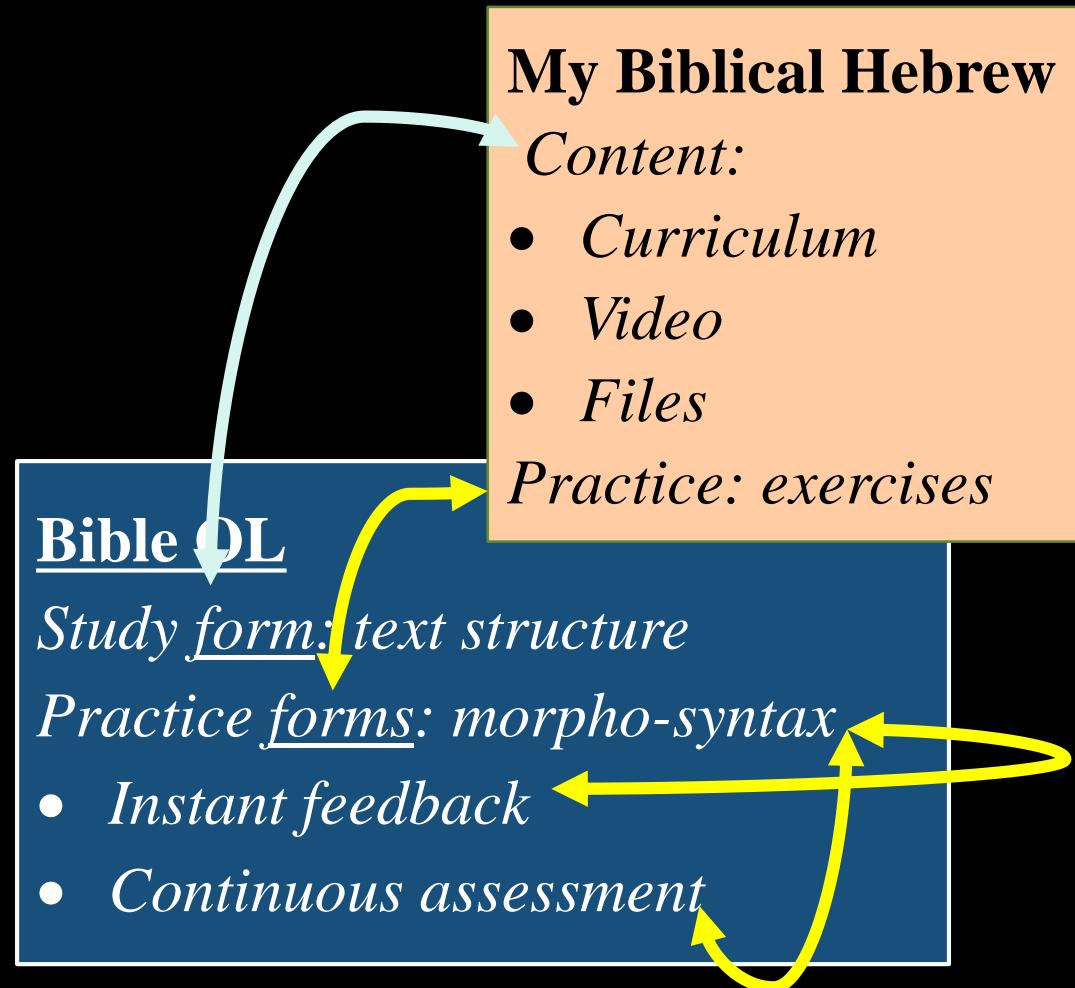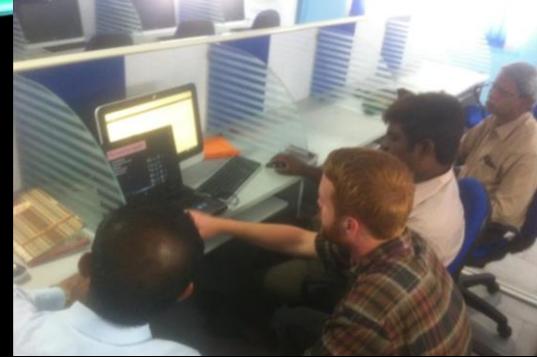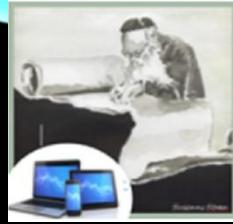
Learner needs
- Content and tasks practiced in advance of f2f
- Practice difficult topics, play, competition
- Peer learning, online support
- Assessment
- Live language use?

Bible OL + MBH
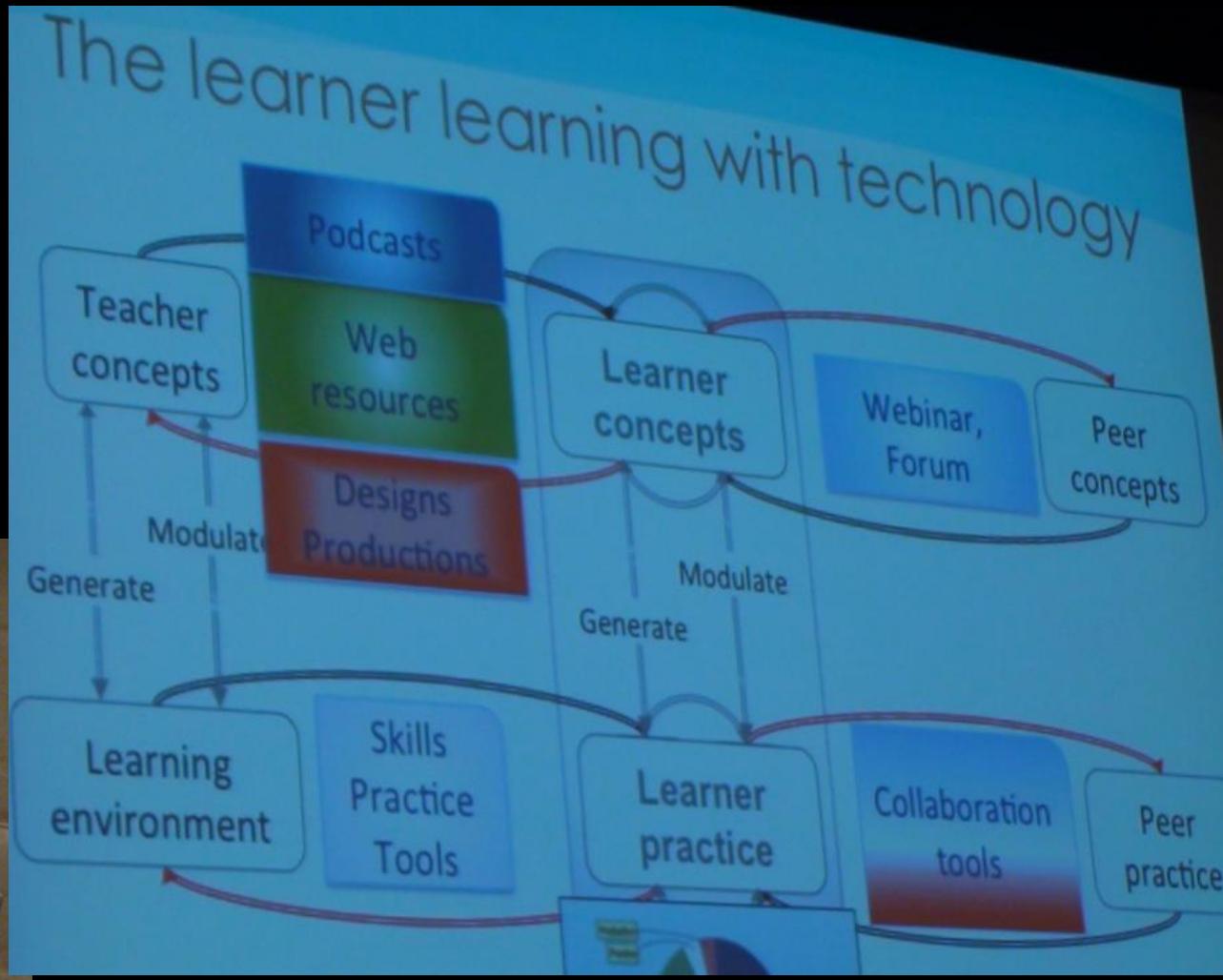
- MBH: learning management system Moodle

- Bible OL

- Enquiry

- Practice

- Instant **feedback**

- Daily formative **assessment**

My Biblical Hebrew
Content:
- *Curriculum*
- *Video*
- *Files*

Practice: exercises

Bible OL
Study form: text structure
Practice forms: morpho-syntax
- *Instant feedback*
- *Continuous assessment*
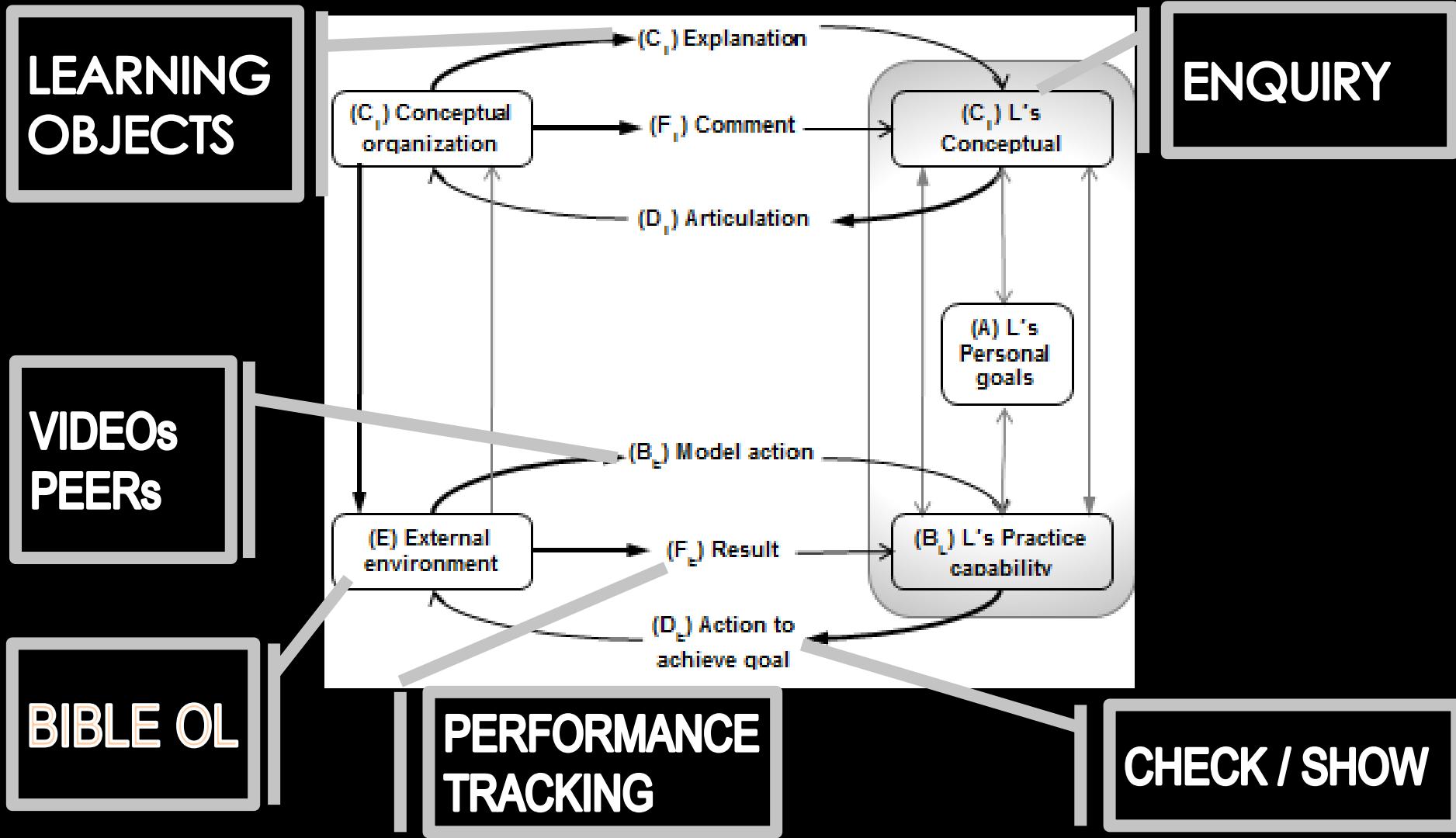
Design for learning

- Diane Laurillard, *Design science* (2012)

Persuasive learning

LEARNING OBJECTS

ENQUIRY

VIDEOs PEERs

BIBLE OL

PERFORMANCE TRACKING

CHECK / SHOW

(C_I) Explanation

(C_I) Conceptual organization

(F_I) Comment

(C_I) L's Conceptual

(D_I) Articulation

(A) L's Personal goals

(B_E) Model action

(E) External environment

(F_E) Result

(B_L) L's Practice capability

(D_E) Action to achieve goal

My Biblical Hebrew 1, 2-1 and 2-2

Available courses

📖 **My Biblical Hebrew 1**
First 8 Units for Beginners' Hebrew - 2,5 ECTS 72 hours. Reading of Gen 1:1-5

📖 **My Biblical Hebrew 2-1**
Next 8 Units on Basic Biblical Hebrew part 1 - 2,5 ECTS 72 hours. Focus on Gen 1:6-2:3.

📖 **My Biblical Hebrew 2-2**
MBH2-2 continues MBH2-1 and focuses on the irregular verb forms and Gen 2:4-3:24

7,5 ECTS Beginner's and Basic Biblical Hebrew Grammar:
- 3 x 8 units, each 2,5 ECTS = 70 hours of work
- proficiency test: aim for 80+ % correct

MBH1 Beginners' Biblical Hebrew:
   Read and type: Gen 1:1-5; vocabulary 101; nouns, phrases, *wayyiqtol*

MBH2.1 Basic Biblical Hebrew I
   Regular verb; Gen 1:6-2:3; vocabulary 202; suffixes; phrase analysis

MBH2.2 Basic Biblical Hebrew I
   Irregular verbs: Gen 2:4-3:24; vocabulary 303; slim learner grammar

From morpho-syntax to poetry
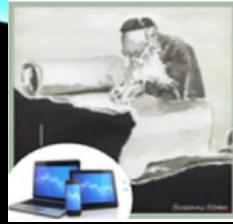
		MBH1	MBH2	TEKST: Level 1	Level 2	Level 3	Level 4
	Poetry						727
	Narrative						
	Syntax 2						
	Syntax 1						
	Stem, irr		202-303				
	Qal Noun	101					
HEB 1501/2	Voc. Freq.	MBH1	MBH2	TEKST: Level 1	Level 2	Level 3	Level 4
TFKU	Texts	Gen 1:1-5 (=0,5)	Gen 1:6-3:24 (=4,5)	Ex 3; 4; 6; 7; 8:1-11 (=7,5)	Jona 1; 3-4(=2,5)	Job 1:1-2:13 (=2)	Psalm 121; 136; 98; 25 (=3)
FIUC-Dk				Gen 11,1-9; 12; 22,1-19 (=2,5)		Job 42:1-6 (=0,5)	Psalms 8; 13; 2; 6 (=2)
				Deut 5:1-33; 6:1-18; 11:13-21 (=3,5)		Jes 2:1-5; 40:1-11 (=1,5)	
	Hrs 550	70	140	210	40	40	50
	ECTS 20	2,5	5	7,5	1,5	1,5	2

Activity	MBH 1	MBH 2-1	MBH 2-2
Exercises	37 hrs 20 min 13000	26 hrs 52 min 15500	25 hrs 12 min
Study	15 hrs 5 min	12 hrs 14 min	12 hrs 13 min
Anki vocab	10 hrst 20 min	12 hrs 58 min	7 hrs 7 min
Reading Translation	10 min	8 hrs 30 min	1 hr 9 hrs 5 min

MBH 2-2: Basic sequel workload and topics

IR-REGULAR	**1**= 11 hrs 18 min	**2**=2 hrs 39 min	**3**=1 hrs 18 min	**4**=1 hrs 37 min
	HYH, wayyiqtol	III´´H; numbers	I´´N, I´´Y	I´´W, Pronouns
SLIM SYNTAX	**5**= 1 hrs 59 min	**6**= 1 hrs 6 min	**7**= 2 hrs 23 min	**8**= 2 hrs 28 min
	II´´W/Y. Adverb	II´´Gem; Dem.	All verbs	Objekt suff
	+24 hrs 7 min	Vocab 303	Test=5 hrs 36 m	**54 hrs 37 min**
	+10 hrs 30 min	Vocab 202	Test= 2 hrs	**60 hrs 34 min**
	+ 6 hrs	Vocab 101	**Test**= 2hrs	**64 hrs 10 min**

Online learner performance

MBH 1-2: Margrethe Bang Rye Kofod (Autumn 2019)

- Total learning activities per unit

MBH 1: Beginner's workhours and topics

READ TYPE	**1**= 6 hrs	**2**= 13 hrs	**3**= 4 hrs 30 min	**4**= 5 hrs 30 min
	10 consonants A-vowels, roots	13 consonants Vowels	Dages 72 proper names	Sheva, reading Type Gen 1:1-5
NOUN Basic VERB	**5**= 9 hrs 30 min	**6**= 4hrs 30 min	**7**= 9 hrs	**8** = 3 t 30 min
	Nouns number, gender, class	Phrases, definiteness	Nouns construct Possessive prep.	(way)yiqtol
	+ 6 hrs	Vocab 101	**Test**= 2hrs	**64 hrs 10 min**
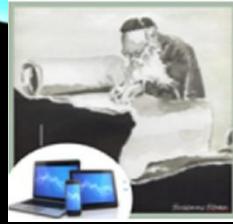
Online learner performance

MBH 1-2: Margrethe Bang Rye Kofod (Autumn 2019)

- Total learning activities per unit

MBH 2-1: Basic initial workload and topics

QAL	**1**= 10 hrs	**2**= 5 hrs	**3**=1 hrs 30 min	**4**=10 hrs 30 min
SUFFIXES	Volitive	Qatal; "nom" cl.	Suffix PP/NP	Non-finite; Qal
REGULAR	**5**= 3 hrs	**6**= 3 hrs	**7**= 5 hrs 30 min	**8**= 9 hrs
STEMS	Hifil; I″alef	Piel, Hitpael	Nifal; III″alef	Gutturals
	+10 hrs 30 min	Vocab 202	Test= 2 hrs	**60 hrs 34 min**
	+ 6 hrs	Vocab 101	**Test**= 2hrs	**64 hrs 10 min**

Online learner performance

MBH 1-2: Margrethe Bang Rye Kofod (Autumn 2019)

- Total learning activities per unit

MBH 2-2: Basic sequel workload and topics

IR-REGULAR	**1**= 11 hrs 18 min	**2**=2 hrs 39 min	**3**=1 hrs 18 min	**4**=1 hrs 37 min
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	+ 6 hrs	Vocab 101	**Test**= 2hrs	**64 hrs 10 min**

Performance

- My Data
  - My performance
  - Students' performance

Bible Online Learner

Home

Text and Exercises ▾

My Data ▾

Font preferences

Profile
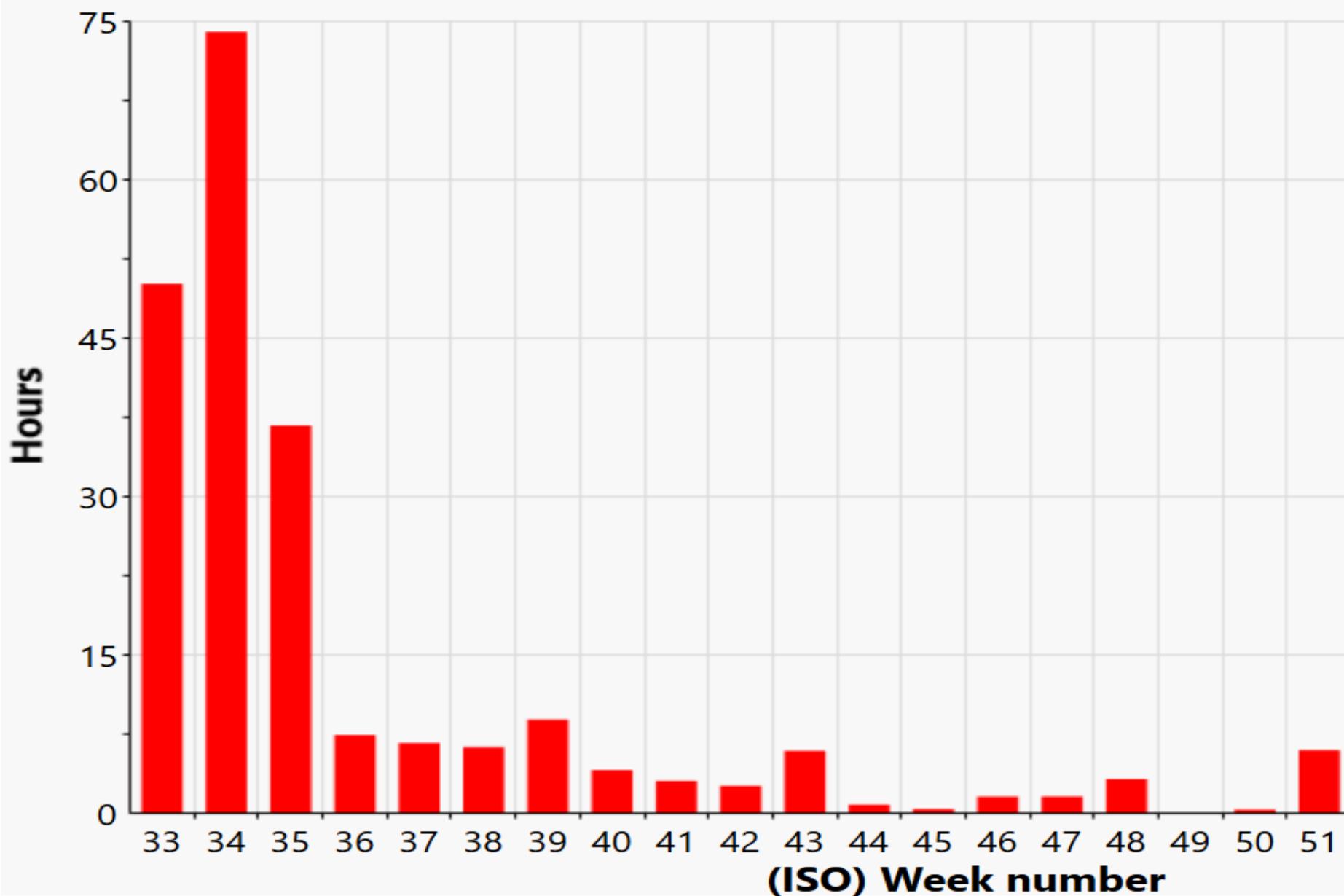
Enroll/unenroll in class

My performance
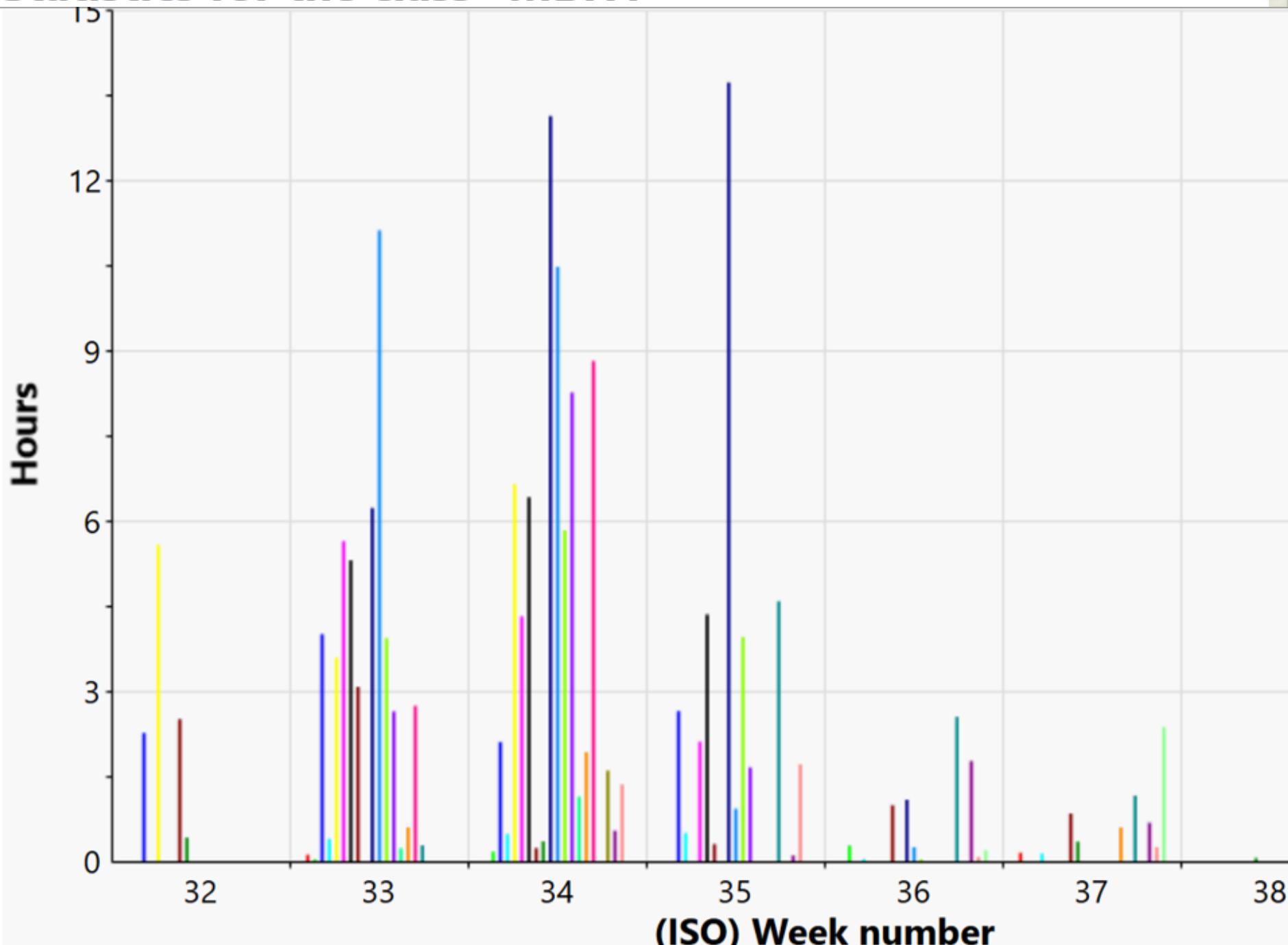
Students' performance

Statistics for the class "MBH1"

Time spent by all students

Statistics for the class "MBH1"

Statistics for the class "MBH1"

ek number	32	33	34	35	36	37	38	39
gner	0:00	0:08	0:00	0:00	0:00	0:10	0:00	0:00
en	0:00	0:03	0:11	0:00	0:17	0:00	0:00	0:00
bsen	2:17	4:01	2:07	2:40	0:00	0:00	0:00	0:07
fod	0:00	0:25	0:30	0:31	0:03	0:09	0:00	0:03
	5:35	3:36	6:39	0:00	0:00	0:00	0:00	0:00
rd	0:00	5:39	4:20	2:07	0:00	0:00	0:00	0:00
le	0:00	5:19	6:26	4:22	0:00	0:00	0:00	0:00
	2:31	3:05	0:15	0:19	1:00	0:51	0:00	0:00
sen	0:26	0:00	0:22	0:00	0:00	0:22	0:04	0:00
raüner	0:00	6:14	13:09	13:44	1:06	0:00	0:00	2:28
	0:00	11:08	10:29	0:56	0:16	0:00	0:00	0:00
r	0:00	3:57	5:51	3:58	0:03	0:00	0:01	0:10
r Knudsen	0:00	2:39	8:16	1:40	0:00	0:00	0:00	0:00

Performance

3. DEVELOPMENT

1. Applications: past, present and future
   1. Bible OL (w. Claus Tøndering)
   2. Role Lexical Module (w. Chris Wilsen)
   3. RRG-BH (w. Christian Canu Højgaard)
2. Exam module: Oliver Glanz (5 min)
3. DaDEL: Ernst Boogert (5 min)

Bible OL

More effective learning

- The wish-list

HIPHIL Novum

Journal for Bible and Digital Resources

Current   Archives   Announcements   About ▾

Current Issue

Vol 5 No 2 (2019)

Published: 2019-11-20

Hope to have (beyond DaDEL)
1. Improve scaffolding with images and learning content for specific classes
2. Vocab-o-meter: hide/show glosses learned/to be studied
3. Graded reader (~James Tauberr).
4. Automated grading (a recommender-system w. machine-learning)
5. Text-to-voice conversion/oral reading of all words

Role-Lexical Module

ETCBC data for Role and Reference Grammar

- RLM 2004-2009: programmer Chris Wilson

- Interface for linguists

Robert Van Valin's theory on the syntax-semantics-pragmatics interface

lex.qwirx.com:8080/lex/clause.jsp

Authentication Required

(?) http://lex.qwirx.com:8080 is requesting your username and password.

User Name: nicolai

Password: ••••••

OK   Cancel

Role-Lexical Module

ETCBC data for Role and Reference Grammar

Robert Van Valin's theory on the syntax-semantics-

Lex by Chris Wilson

RLM for BH: Nicolai Winther-Nielsen

Home Databases Published Browse Search Lexicon Parser Rules Database Dump

Navigator			
Book	**Chapter**	**Verse**	**Clause**
Genesis	2	GEN 02,15	wayyiqqaḥ yᵉhwāʰ ʔᵉlōhîm ʔet hāʔādām

וַיִּקַּ֧ח יְהוָ֛ה אֱלֹהִ֖ים אֶת הָֽאָדָ֑ם

wa= yyi-	Ø- qqaḥ- Ø=	Ø	yᵉhwāʰ- Ø=	Ø	ʔᵉlōh- îm=	Ø	ʔet	hā= ʔādām-	Ø=	Ø
CLM NARR	Qa take	3Msg CLT	the.Lord MsgAB CLT	god	MplAB CLT	P	ART	human.being	usgAB	CLT

And the Lord God took the man, and put him into the garden of Eden to dress it and to keep it.

Predicate text is: LQX[

Role-Lexical Module

ETCBC data for Role and Reference Grammar

- RLM 2004-2009: programmer Chris Wilson

- Re-write rules for parser

Robert Van Valin's theory on the syntax-semantics-pragmatics interface

Parse finished with 3 possible trees. Showing the first 3:

	SENTENCE											
CONJ	CLAUSE											
wa	CORE											
	NUC				NP					PP		
	PRED				$COORE_N$		NP		P	NP		
	V				NUC_N		$CORE_N$		ʔet	$CORE_N$		
	V_{Stem}		AG_{PSA}	$PRON_{DCA}$	N		NUC_N			NUC_N		
	V_{TAM}	V_{STM}	V_{NUC}	-		N_{NUC}	N_{GNS}	N_{POS}	N		N	
	yyi-	-	qqaḥ-			yᵉhwāʰ-	-		N_{NUC}	N_{GNS}	N_{POS}	ART	N_{NUC}	N_{GNS}	N_{POS}
						ʔᵉlōh-	îm-				hā	ʔādām-	-

RRG-BH

ETCBC data for Role and Reference Grammar

- RRG-BH 2019-: programmer, co-director in command Christian Canu Højgaard

- Create trees: https://rrg-bh.phil.hhu.de/editor/index

Laura Kallmeyer's *TreeGraph* at Heinrich Heine Universität Düsseldorf

| RRG-BH | Browse | Help | Annotation guidelines |

Browse Gold Sentences

31 gold sentences.

1. wa yyˈōmer ʔel- śārˈay ʔištˈ 3ms

16. wa yyiqqˈaḥ [yᵊhwₐāh] ʔelōhˌîm ʔeṯ- hˈā ʔāḏˈām

RRG-BH

ETCBC data for Role and Reference Grammar

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RRG-BH

wa yyiqqˈaḥ [yᵊhw‿āh] ʔᵉlōh‿îm ʔet- hˈā ʔāḏˈām **2 annotators** **gold**
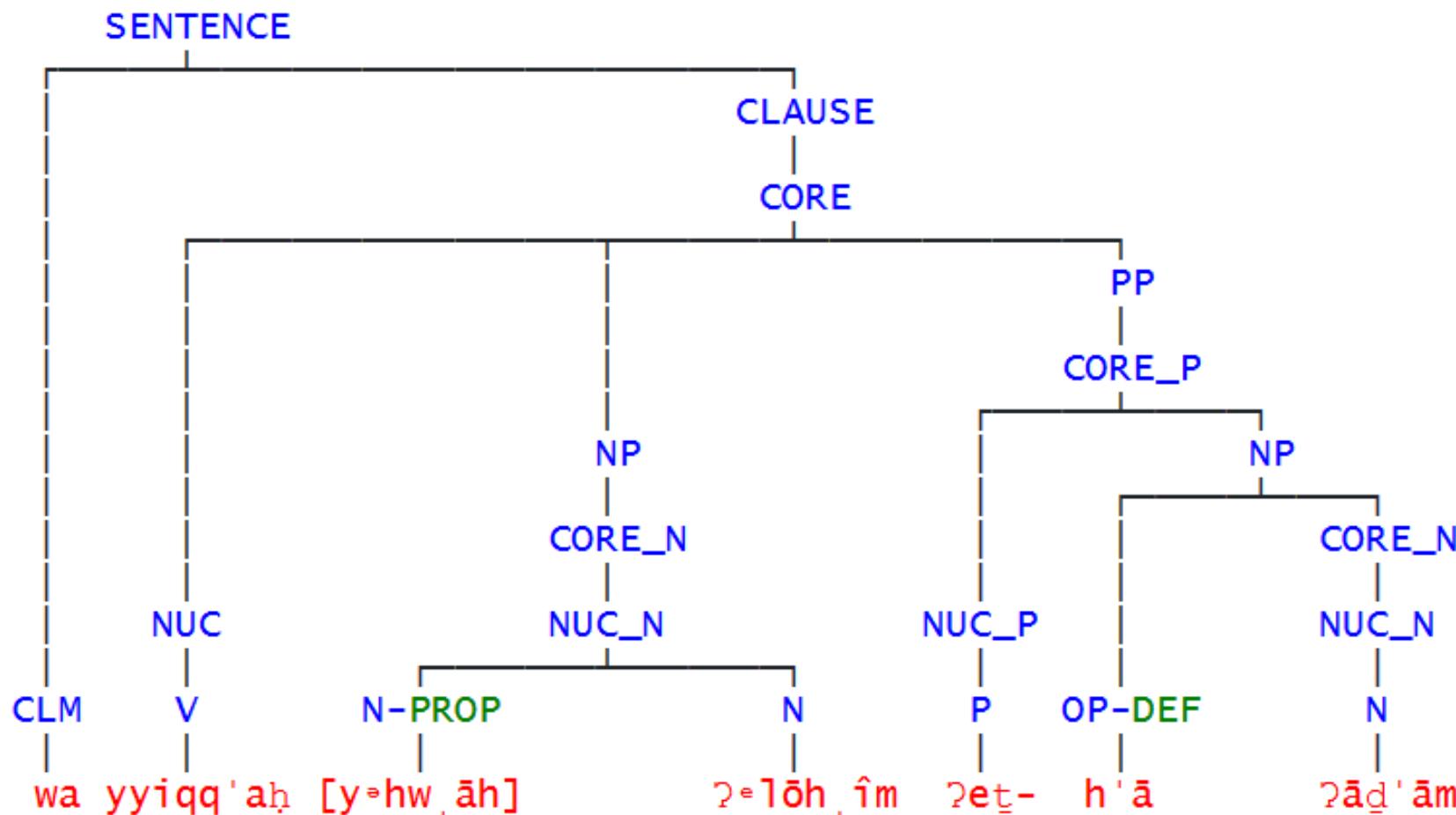
ptb | **ptb2rrg** | gold

wa yyiqqˈaḥ [yᵊhwˌāh] ʔᵉlōhˌîm ʔeṯ- hˈā ʔāḏˈām **2 annotators** **gold**

ptb   ptb2rrg   gold

MODULE & ADAPTION

Outline

1. A Corpus-application: Bible Online Learner

2. Design for learning: *My Biblical Hebrew*

3. Development

   1. Applications: past, present and future

      1. Bible OL (w. Claus Tøndering)

      2. Role Lexical Module (w. Chris Wilsen)

      3. RRG-BH (w. Christian Canu Højgaard)

   2. Exam module: Oliver Glanz (5 min)

   3. DaDEL: Ernst Boogert (5 min)

NIAS
Lorentz center
Workshop @Snellius

Processing Ancient Text Corpora
17 - 21 February 2020, Leiden, the Netherlands

Scientific Organizers
- Cody Kingham, University of Cambridge
- Wido van Peursen, VU Amsterdam
- Dirk Roorda, DANS-KNAW
- Nicolai Winther-Nielsen, FIUC-DK

Topics
- Linguistic research
- Ancient languages
  (esp. Ancient Hebrew, Syriac, Arabic)
- Machine Learning
- Educational Tools