ONLINE ACCESS, DISTRIBUTION AND FURTHER COLLABORATIVE DEVELOPMENT OF THE **NATO ADL HANDBOOK**

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We reviewed in-depth several options for the online access, interactive distribution and further collaborative development of the NATO ADL handbook, using the following criteria:

- **Level of interactivity**
- **xAPI compatibility**
- **Set up convenience**
- **User friendly**

Mapping the immediate, adjacent and theoretical stakeholders, we can make firm recommendations for LRS options, server set up requirements and a list of recommended verbs to be monitored in the collaborative environment.

- **Recommended LRS options:**
    - ADL (https://github.com/adlnet/ADL_LRS)
    - Learning Locker v2 (https://www.ht2labs.com/learning-locker/)

- **Minimum LRS set up requirements:**
    - VPS with minimum 8Gb RAM / 2 cores.

- **Recommended list of verbs:**

Label	ID (url)	Description
abandoned	https://w3id.org/xapi/adl/verbs/abandoned	Indicates the activity provider has determined that the session was abnormally terminated either by an actor or due to a system failure.
annotated	https://w3id.org/xapi/adb/verbs/annotated	Provide notes or symbols for further explanation or thoughts while reading.
answered	http://adlnet.gov/expapi/verbs/answered	Indicates the actor replied to a question, where the object is generally an activity representing the question. The text of the answer will often be included in the response inside result.

bookmarked	https://w3id.org/xapi/adb/verbs/bookmarked	Persisting the current location (page) where the reader stopped the ebook activity.
commented	http://adlnet.gov/expapi/verbs/commented	Used to add a comment in a forum or other web application.
completed	http://adlnet.gov/expapi/verbs/completed	Indicates the actor finished or concluded the activity normally.
entered	http://adlnet.gov/pebl/verbs/entered	Indicates the actor has entered a PEBL ebook or a demarked subsection of the eBook identified with a CFI canonical fragment identifier
exited	http://adlnet.gov/expapi/verbs/exited	Indicates the actor intentionally departed from the activity, object , or demarked subsection of the eBook identified with a CFI canonical fragment identifier
failed	http://adlnet.gov/expapi/verbs/failed	Indicates the actor did not successfully pass an activity to a level of predetermined satisfaction.
hiding (HID)	http://adlnet.gov/pebl/verbs/hid	Indicates the actor intentionally hid content using Show/Hide scriptable object

highlighted	https://w3id.org/xapi/adb/verbs/highlighted	Used to indicate a learner highlighting important areas in the content for the purpose of later review or note taking.
initialized	http://adlnet.gov/expapi/verbs/initialized	Indicates the activity provider has determined that the actor successfully started an activity.
interacted	http://adlnet.gov/expapi/verbs/interacted	Indicates the actor engaged with a physical or virtual object.
link	http://adlnet.gov/expapi/activities/link	A link is simply a means of expressing a link to another resource within, or external to, an activity. A link is not synonymous with launching another resource and should be considered external to the current resource. Links are not learning content, nor SCOs. If a link is intended for this purpose, it should be re-categorized.
logged-in	https://w3id.org/xapi/adl/verbs/logged-in	Indicates the actor gained access to a system or service by identifying and authenticating with the credentials provided by the actor.
logged-out	https://w3id.org/xapi/adl/verbs/logged-out	Indicates the actor either lost or discontinued access to a system or service.

morphing (morphed)	http://adlnet.gov/pebl/verbs/morphed	Indicates the actor elected to view an alternate version of content displayed within the ebook page.
noted	https://w3id.org/xapi/adb/verbs/noted	Add annotation or notes to selected text within an ebook or highlight.
paged-jump	http://adlnet.gov/pebl/verbs/paged-jump	Indicates the actor navigated to a page within the book other than next or previous. This is triggered by use of the navigation bar, TOC navigation, or internal hyperlink to another page.
paged-next	http://adlnet.gov/pebl/verbs/paged-next	Indicates the actor used swipe, click or tap navigation to advance to the next page
paged-prev	http://adlnet.gov/pebl/verbs/paged-prev	Indicates the actor used swipe, click or tap navigation to reverse to the previous page
passed	http://adlnet.gov/expapi/verbs/passed	Indicates the actor successfully passed an activity to a level of predetermined satisfaction.
popoutHide (hid)	http://adlnet.gov/pebl/verbs/popout-hid	Indicates the actor elected to hide a visible popout text block, authors note, study note
popoutShow (showed)	http://adlnet.gov/pebl/verbs/popout-showed	Indicates the actor elected to show a hidden popout text block, authors note, study note

preferred	http://adlnet.gov/expapi/verbs/preferred	Indicates the selected choices, favored options or settings of an actor in relation to an object or activity.
responded	http://adlnet.gov/expapi/verbs/responded	Used to indicate a user responding to a help or chat request
searched	https://w3id.org/xapi/adb/verbs/searched	A digital content search within a document or application.
shared	http://adlnet.gov/expapi/verbs/shared	Indicates the actor's intent to openly provide access to an object of common interest to other actors or groups.
showing (showed)	http://adlnet.gov/pebl/verbs/showed	Indicates the actor elected (cannot tell from data)
terminated	http://adlnet.gov/expapi/verbs/terminated	Indicates that the actor successfully ended an activity.
voided	http://adlnet.gov/expapi/verbs/voided	A special reserved verb used by a LRS or application to mark a statement as invalid. See the xAPI specification for details on Voided statements.

Currently, we do not yet have requirements on the level of interaction. Unless motivated, eBook readers tend to keep interactions at minimal level.

We selected two major options for creating a simple framework for publishing the NATO ADL handbook in such circumstances:

Option #1: Framework utilizing Personalized eBooks for Learning (PEBL)

PeBL (https://peblproject.com/) is designed to provide a wide range of xAPI statements sending options, triggered by user activities already preset to be tracked in a number of advanced widgets provided by the library.

PeBL **natively utilizes Learning Locker v2 as a default LRS**, sending data for the **teacher dashboard**, which enables real time tracking of a number of key components of readers' activities:

- Total time spent
    - in the book
    - in selected chapters of a book
    - in a CFI delineated segment
    - between actions
    - per question in assessments

- All user clicks on interface controls and links within content

- All user annotations including highlight and bookmark annotations

- Book reading progress (e.g. accessed chapters, percent read for each chapter, etc.)

- Statistics on times of the day when reading took place

- Quiz related data, e.g. average scores on embedded quizzes, answers to individual questions etc.

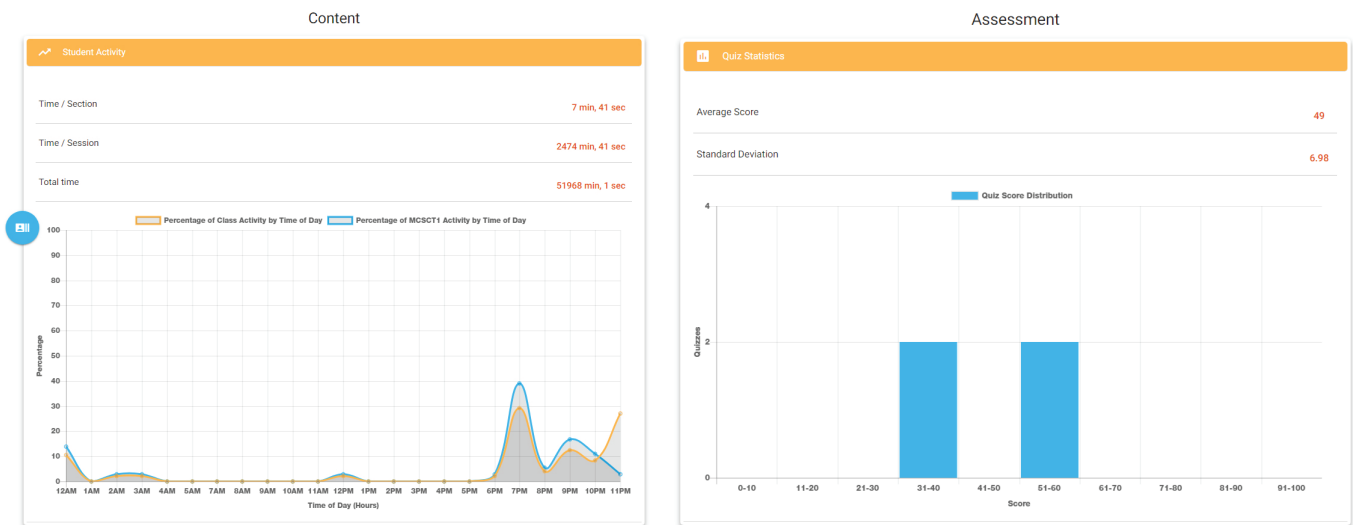- Content of reader discussions, organized in threads

Illustration 1: Teacher's dashboard PEBL

PROS:

+ Possibility to incorporate advanced interactive content throughout eBook (embedded quizzes, collaborative reading, comments exchange; other user input like annotations, highlights or book-marks)

+ Integrated dashboard

+ Integrated login solution for secure access

+ ADL project with community

+ Possibility to partly automate the extensions[1] implementation process using shortcodes[2]

CONS:

- The overall lack of documentation complicates the work (what could otherwise be done by simply embedding appropriate triggers, requires sifting through 15.000+ lines of code with uncertain outcome)

- Pebl extensions are not user friendly and generally require substantial manual entry on every page.

- Additional functionality can be added to Pebl through building extensions, but the documentation is sparse.

Pebl (https://peblproject.com) could enable complex interactivity, it utilizes xAPI, but it is not very convenient to set up due to poor and outdated documentation.

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[1] Extensions provide more complex interactions
[2] Shortcodes exist in the documentation, but the link that should explain them is not active, nor is there any explanation on how they could be actually implemented

Option #2: Creating an interactive eBook from scratch

An interactive eBook could be created by utilizing Sigil (https://sigil-ebook.com/), an open-source tool for eBook editing (similar to Word or OpenOffice, but specific for eBooks) and embedding triggers for sending xAPI statements for every significant user activity related event. This can be achieved by utilizing ADL's xAPI wrapper (https://github.com/adlnet/xAPIWrapper).

The user interaction and tracking will be somewhat limited to:

• Overall reader progress (e.g. accessed chapters, percent read for each chapter, etc.)
• Actions undertaken (opening links, pop ups, or discussion started)
• Time spent

Illustration 2: Learning Locker Dashboard

PROS:

+ Straightforward work plan

+ Possibility to develop any specific requirement in a clear-cut way

CONS:

- Manually added triggers for every type of interaction.

- Lack of advanced interactive tools (threaded discussions, carrousel, quizzes and similar complex interactions)

- Login solution need to be developed for secure access

Sigil (https://sigil-ebook.com/) is predominately an editor and interactivity is limited. xAPI is simply added with JavaScript (xAPI wrapper). It is easy to set up and can send clean statements to an independent LRS.