MADLx: Setting Foundations to Measure ROI

LEARNING ANALYTICS SURVEY REPORT
DI-MISC-80711A

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The Maturing ADL in Multinational Exercises (MADLx) project aims to design and develop a Return on Investment (ROI) analytics dashboard for use in multinational and coalition exercises. A key component of creating the dashboard was knowing the large and varied group of exercise stakeholders' requirements for learning analytics and associated visualizations. Therefore, we collected data from 263 stakeholders through interviews and surveys at Advanced Distributed Learning (ADL) conferences and meetings, asking about their understanding and experience with learning analytics and the type of analysis and visualizations they want to see. This report presents the analysis of detailed feedback from exercise stakeholders concerning their requirements for learning analytics and associated visualizations.

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MADLⁿ

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EXECUTIVE SUMMARY

The Maturing ADL in Multinational Exercises (MADLx) project aims to design and develop a Return on Investment (ROI) analytics dashboard for use in multinational and coalition exercises. A key component of creating the dashboard was knowing the large and varied group of exercise stakeholders' requirements for learning analytics and associated visualizations. Therefore, we collected data from 263 stakeholders through interviews and surveys at Advanced Distributed Learning (ADL) conferences and meetings, asking about their understanding and experience with learning analytics and the type of analysis and visualizations they want to see.

We maintained methodological consistency to ensure a measure of utility in our text analysis of the stakeholder responses. We divided results into three major observation groups: current implementation of learning analytics, future plans for learning analytics use, and obstacles to learning analytics implementation. After applying quantitative analysis to all raw content, we prepared word frequencies and identified the top-ranked words in each of the subcategories as key topics. We then used Part-of-Speech (POS) tagging to conduct the text analysis and reach the conclusions presented in this paper. We discovered a common stakeholder need, despite their differences: a learning analytics dashboard to utilize before, during, and after a training event that turns their exercise data stream into actionable feedback.

Through the POS tagging, we identified six words that became the key requirements for the MADLx ROI dashboard prototype: useful, versatile, interoperable, editable, free, and real-time. The prototype satisfies each of them. It is tied to multinational exercises, addressing stakeholder lack of understanding about learning analytics (Usefulness). It provides multiple user profiles with different levels of access, meeting the different needs of trainers, trainees, managers, flag officers, and exercise organizers (Versatility). It collects and retrieves Experience API (xAPI) data from a wide variety of mission rehearsal systems (Interoperability). Users can edit or change each of the dashboard's visual representations (Editability). The prototype is fully built on a set of open-source technologies (Free); and it is connected live to a Learning Record Store (LRS), and potentially other databases, enabling actionable insights into the learning process (Instantaneous).

SCOPE

The Maturing ADL in Multinational Exercises (MADLx) project aims to design and develop a Return on Investment (ROI) analytics dashboard for use in multinational and coalition exercises. The ROI dashboard should include a set of pre-attentive attributes to serve exercise stakeholders as end users. This paper presents the analysis of detailed feedback from exercise stakeholders concerning their requirements for learning analytics and associated visualizations.

The MADLx project regularly consults with the ADL Initiative's technical staff and leadership to ensure that the project's methods and lessons learned can be considered across the broader research interests of the Total Learning Architecture (TLA). The regular use of xAPI and learner-centric methods of MADLx compliment the ADL Initiative goal of enabling the future learning ecosystem across government.

Military training is distinguished from all other forms of training by its emphases on discipline, just-in-case preparation, and collective training.[1] Such a large and varied exercise stakeholder group makes it difficult to compile a single, comprehensive list of requirements for the entire target audience. Therefore, we conducted multiple stakeholder interviews, which provided a base platform for effective text analysis. We held discussions with stakeholders in a series of formal and informal settings to collaboratively develop a view of their requirements and expectations for learning analytics over time and across a series of multinational exercises.

We collected:
- data on current community understanding of, experience with, and perceived risks and opportunities related to learning analytics (particularly as tied to military exercises), and
- recommendations for the types of analyses stakeholders would like to see and their suggestions of how to represent those visualizations.

SURVEY OPPORTUNITIES

- ADL Global Partnership Network Annual Directors' Meeting (virtual), April 21-26, 2020
- Partnership for Peace Consortium ADL Working Group, (virtual), September 24-25, 2020
- MADLx Stakeholders Meeting and Working Group (virtual), September 24, 2020
- NATO Training Group Task Group Individual Training & Education Developments (NTG TG IT&ED) (virtual), November 9-12, 2020
- Ukraine ADL National Conference (virtual), November 20, 2020
- Regional ADL Initiative (RADLI) Annual Conference, Sarajevo (virtual), November 26, 2020
- ADL Global Partnership Network Annual Directors' Meeting (virtual), December 8, 2020
- NTG ADL in Exercises Annex Task Group Meeting (virtual), December 15, 2020
- NTG ADL in Exercises Annex Task Group Meeting (virtual), January 28, 2021

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[1] Fletcher J.D, Chatelier P.R. (2000) An Overview of Military Training: Institute for Defense Analysis, Alexandria, Virginia.

SURVEYED AUDIENCE

We have recorded and included in this study observations of 263 individuals. Our sample, however, is not representative of the population; and while our analysis is indicative, it is not intended to rise to the level of statistical reliability. The audience represents participants in the ADL conferences and meetings listed above as survey opportunities. The total number of observations is composed of 3% interviews and 97% written answers within larger survey questionnaires run by various stakeholder entities. (Figure 1)
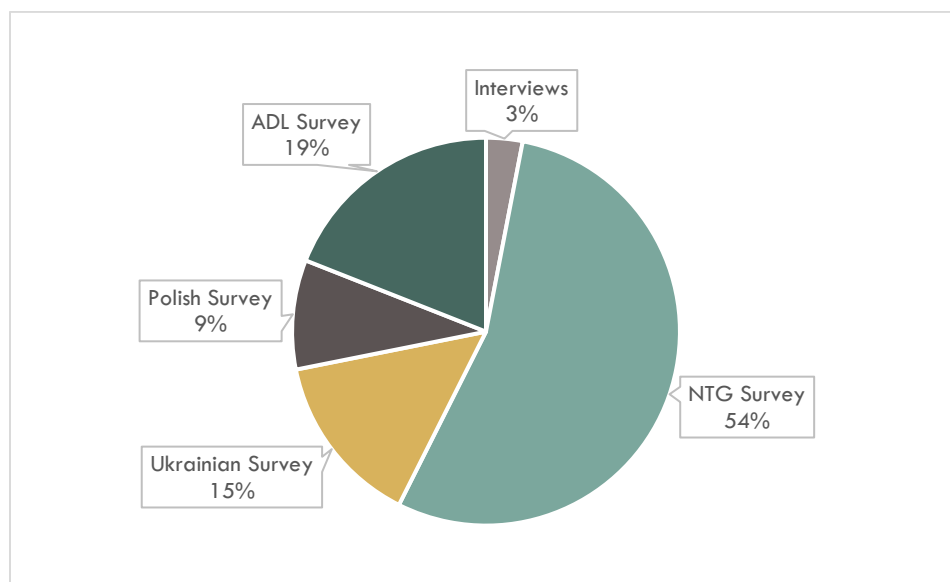
Figure 1. Surveyed audience

METHODOLOGY

We maintained methodological consistency to ensure a measure of utility in the analysis of the responses from the different group of stakeholders. We collected transcripts and notes from the interviews and meetings and concatenated them with polls results, dividing them into three major observation groups:

A) Current implementation of learning analytics
B) Future plans for use of learning analytics
C) Obstacles to learning analytics implementation

We began by applying quantitative analysis to all raw content, generating stemmed n-grams (unigrams, bigrams, and trigrams). The n-grams which met the minimum frequency threshold of 0.3% were passed to the graph database as the number of instances per relative group of observations. We prepared word frequencies as a relative rounded number of instances per 10,000 words. We disregarded the common words and identified the top-ranked words in each of the subcategories as KEY TOPICS. The subsequent qualitative data analysis provided us with values from the text by interpreting it from a given contextual perspective. This was achieved with POS (Part-of-Speech) tagging to identify the grammatical group of a given word: whether it is a noun, pronoun, adjective, verb etc. based on the context. In a particular context,

we gained POS relationships within the sentence and assigned a corresponding tag to the word, creating conclusions with lists of ROI dashboard requirements as MADLx solutions for stakeholders' issues with learning analytics.

FINDINGS

Current implementation

Sample survey question: What are you or your military training/education systems currently doing with learning analytics? (Figure 2)

Figure 2. Word cloud: learning analytics current use

We identified the following key topics in this category:

1. TRAINING
2. MATERIALS ACQUISITION
3. NOTHING (N/A)

The contextual analysis revealed that the audience's current use of learning analytics is associated with military training rather than any other type of learning. The sample included phrases such as, "improve

TRAINING programs," "use data for adopting TRAINING," "manage the TRAINING process," "analyze TRAINING materials," and "language TRAINING intensification."

Materials acquisition contextually is associated with benefits of learning analytics to training. Sample observations included phrases such as, "help training MATERIAL ACQUISITION," "analysis of training MATERIALS ACQUISITION," and "contribute to better effectiveness of training MATERIALS ACQUISITION."

It is important to note that 18.6% stakeholders answered NOTHING to this survey question (thereby declaring that they do not currently use learning analytics) or indicated that they are not even familiar with the term learning analytics by answering N/A (not applicable).

Future implementation

**Sample survey question**: What would you like to do with learning analytics? (Figure 3)

Figure 3. Word cloud: learning analytics future plans

We identified the following key topics in this category:

1. LEARNING
2. IMPROVE TRAINING
3. STUDENTS

The contextual analysis revealed that the audience plans to utilize learning analytics to generally enhance the learning process in their organizations. The sample observations included phrases such as, "analyze LEARNING progress in a course," "how to improve quality of LEARNING," and "to enhance LEARNING experience."

Obstacles to implementation

Sample survey question: What is stopping you from utilizing learning analytics? (Figure 4)

Figure 4. Word cloud: learning analytics obstacles
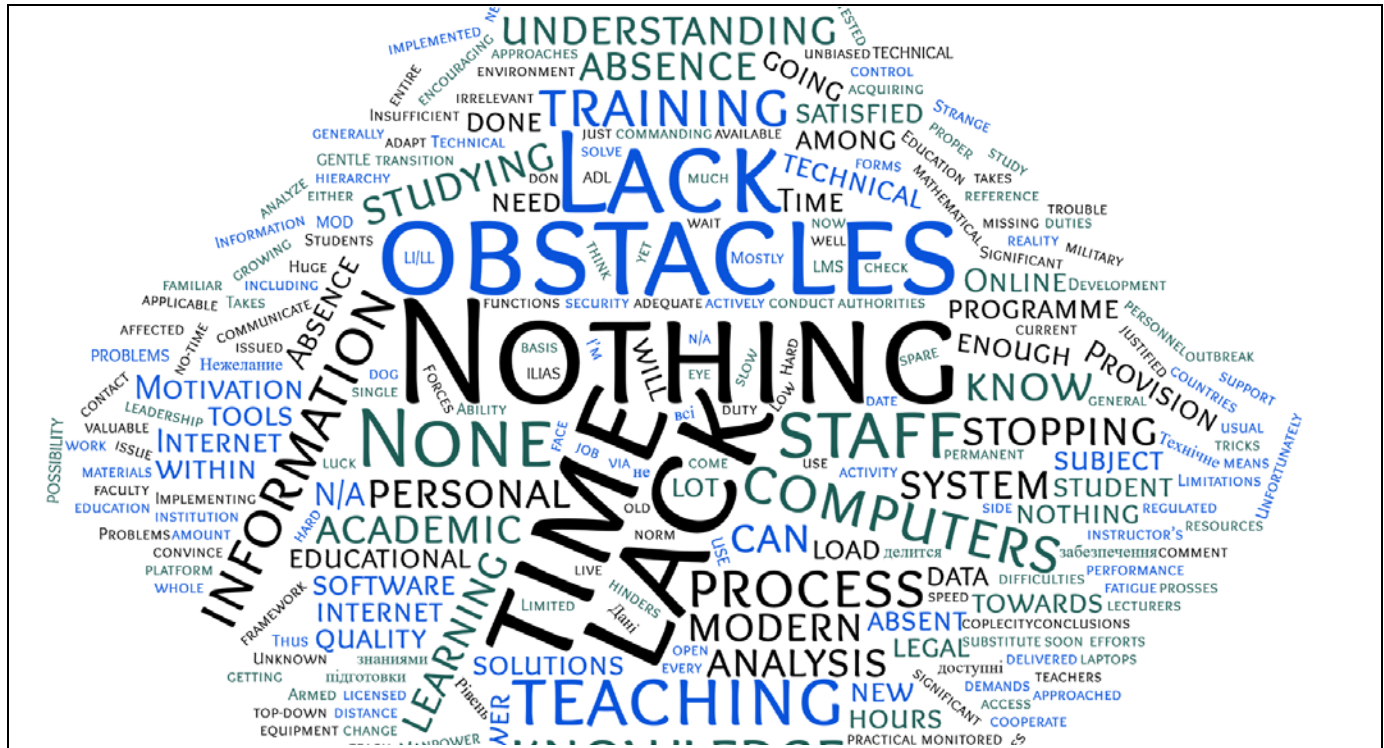
We identified the following key topics in this category:

1. LACK OF TIME
2. NO OBSTACLES or NOTHING
3. UNDERSTANDING and INFORMATION

We identified with contextual analysis that stakeholders identify TIME (LACK OF) as a key reason why learning analytics is not implemented in their respective organizations. The sample observations included phrases such as, "out of the scope of my job, NO TIME," and "NO TIME to study implementation."

Meanwhile, many stakeholders answered that they face "NO OBSTACLES" or that "NOTHING" is stopping them from implementing learning analytics. Their failure to do so despite the lack of impediments indicates a lack of understanding and/or information about learning analytics and its aim.

## RETURN ON INVESTMENT (ROI) DASHBOARD

The MADLx project aims to design and deliver an ROI learning analytics prototype dashboard which considers the needs of stakeholders and the situations in which they will use it.[2] The surveys and interviews illuminated a common need among the stakeholders, despite their differences: a learning analytics dashboard

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[2] Cuban, L. (2001). Oversold & underused: Computers in the classroom: Harvard university press Cambridge, Massachusetts London, England

to utilize before, during, and after a training event that turns their exercise data stream into actionable feedback. This became the starting point for designing the dashboard.

With POS tagging, we identified three words we had previously recognized: USEFUL, VERSATILE, and INTEROPERABLE.[3] We also discovered three new words: EDITABLE, FREE, and REAL-TIME. These six words became the key requirements list for the ROI dashboard, and we computed the percentage of participants who were tagged with any of the words in these categories.

The highest percentage of participants in the sample related to USEFUL (29%). The category of INTEROPERABLE was second (23%), and FREE came in third (18%). They were followed by EDITABLE (13%) and VERSATILE (11%), with REAL-TIME (6%) coming last. (Figure 5)
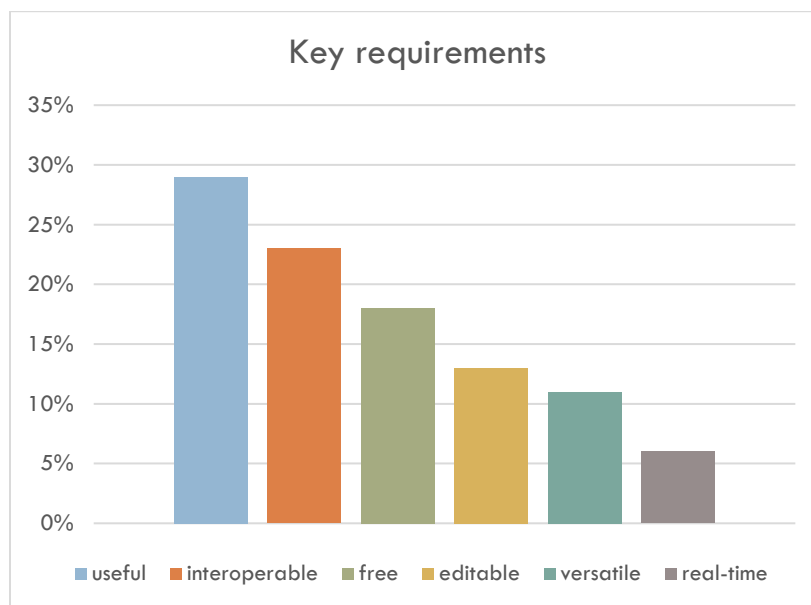
Figure 5. ROI dashboard categories

This is the description of the word categories:
- USEFUL: To show real-time performance results for training and learning, and to get familiar with learning analytics advantages
- VERSATILE: To allow multiple interested parties (users) to steer the same application
- INTEROPERABLE: To be able to incorporate into existing training environment
- EDITABLE: To allow users to arrange their own visual interpretations of data
- FREE: To be built on open-source technology or folded into exiting Business Intelligence (BI) tools
- REAL-TIME: To generate quick, actionable insights into the learning and training process

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[3] Learning Analytics Stakeholder Survey (Initial), DI-MISC-80711A, (2020)

CONCLUSIONS

The survey sample of 263 individuals is not representative of the general population, and it is not intended to rise to the level of statistical reliability; the data serves as indicative analysis for the development of the ROI dashboard prototype within the MADLx project.

We maintained methodological consistency to ensure a measure of utility in the analysis of the responses from a different group of stakeholders, and we developed an indicative list of key requirements for creating the learning analytics dashboard.

We developed the prototype ROI dashboard by following these key requirements:
- USEFULNESS: The prototype is tied to multinational exercises, and it directly addresses stakeholder lack of understanding about what learning analytics is and how useful it can be.
- VERSATILITY: The prototype provides multiple user profiles with different levels of access, satisfying the needs of trainers and trainees as well as managers, flag officers, and exercise organizers.
- INTEROPERABILITY: The collection and retrieval of Experience API data (xAPI) from a wide variety of systems utilized by stakeholders in mission rehearsals.
- EDITABILITY: Each visual representation can be edited or changed with another type of form, color, or data input in the prototype.
- FREE: The prototype is fully built on a set of open-source technologies.
- INSTANTANEOUS: Live connections to Learning Record Store (LRS) and potentially other databases, enabling actionable insights into the learning process.

APPENDICES: RAW DATA FILES