

# Predictors of successful learning outcomes in e-learning courses

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## BACKGROUND

Global e-learning revenue was estimated at \$US46.6 Billion in 2016 (Adkins, 2016). There is however little consensus regarding predictors of successful e-learning outcomes or intended audience of e-learning. With often no economic cost to enrolling, some participants have no intention to fully engage with learning or achieve expected outcomes and up to 50% of participants are teachers using e-learning to source classroom material without actively engaging in learning (Ho et al., 2015). Understanding the intent and individual expectations of a participant helps to identify what a successful outcome would be, and how a provider can best enable success for the intended audience (Wagner, 1997).

## MEASURING INTENT

There are three learning outcomes by which success can be measured; information acquisition, information application and information consolidation (Havard, Du, & Olinzock, 2005).

Research suggests the following factors can predict success (Castaño-Muñoz, Duarte, & Sancho-Vinuesa, 2014; Garrison & Cleveland-Innes, 2005; Kizilcec, Piech, & Schneider, 2013; Morris, Finnegan, & Wu, 2005; Ramos & Yudko, 2008):

1. Quantity - The number of interactions with content.
2. Quality - The duration and breadth of interaction.
3. Type - Content type interacted with, e.g. video.

## PREDICTING SUCCESSFUL OUTCOMES

Results of measuring outcomes against the reported success factors. The chosen attributes to measure quality, quantity and type are;

1. nevents – total number of interactions - quantity.
2. ndays\_act - number of unique days active - quality.
3. nplay\_video & pchapters - number of each type of content interacted with - type.

The overall effect of each attribute can be shown by plotting the total number of participants at each increasing increment of said attribute.

## METHODOLOGY

The 2012/13 Harvard/MIT online course dataset (MITx and HarvardX, 2014) provided raw data for two years of open online courses from fall 2012 to summer 2013, containing 20 attributes and 641,138 rows of enrolment data in science and non-science courses by local and international participants of various educational backgrounds.

1. Relevant attributes were selected from the 20 attributes. Summary statistics were developed using Microsoft Excel ensuring the analysed data was representative of the source dataset after cleaning.
2. The data was cleaned to remove erroneous values and ensure consistency. The final dataset included only participants that had viewed and interacted with the content and had a final grade, keeping only participants intending to pass, removing 45.49% of the original dataset.
3. Data analysis was conducted through Excel and Weka (Mark Hall, 2009).
4. Results of the analysis were graphed in Excel using 100% stacked column charts showing total certified and uncertified (Figures 1-4).

## RESULTS

Quantity was related to a successful outcome but quickly reached a plateau as shown in Figure 1. Quality analysis revealed that higher days active resulted in a greater success rate with an optimal duration between 50 to 150 days as shown in Figure 2.

Type of interaction showed chapters being correlated more strongly with success than videos, as seen when comparing Figure 3 and Figure 4. Given that 86% of successful participants viewed less than 900 videos, and 82% of successful participants viewed over 75% of chapters, we can see both a plateauing effect for videos viewed and a minimum requirement for success in chapters viewed.

Contrary to previous research, this work suggests that traditional teaching materials should be integrated in e-learning systems, and frequent interactions over 50 to 150 days is optimal for a successful outcome.

## Future work

Further research is planned to identify success factors based on intent and participant characteristics. This will inform e-learning design for each participant group.

## References

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### Total number of unique events (nevents)

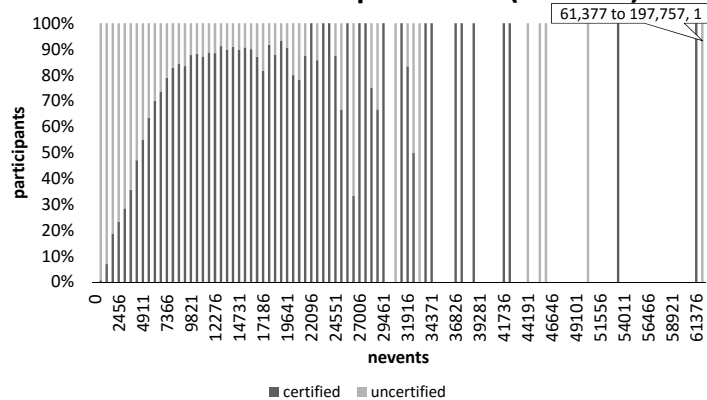


Figure 1 total number of unique events

### Total number of days active (ndays\_act)

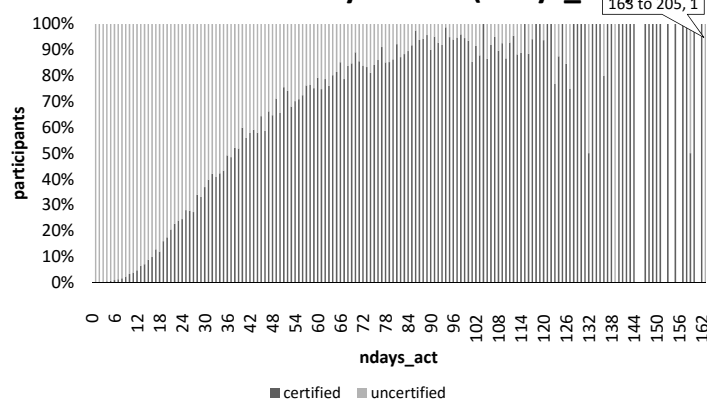


Figure 2 total number of days active

### Total number of unique video events (nplay\_video)

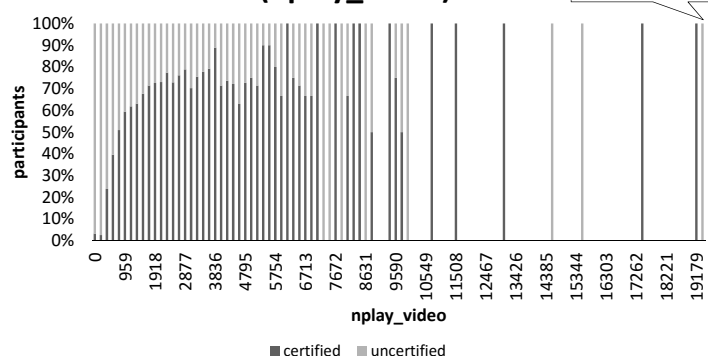


Figure 3 total number of unique video events

### Total percentage of chapters viewed (pchapters)

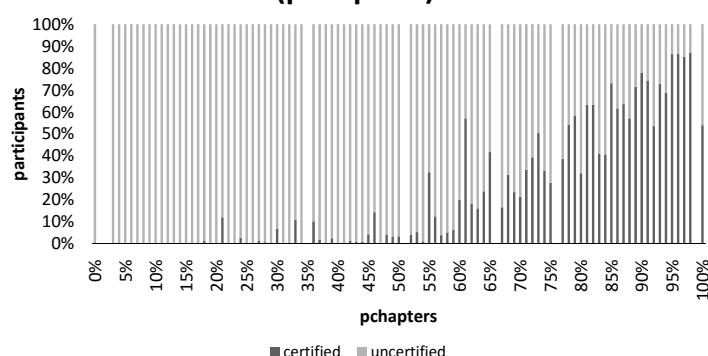


Figure 4 total percentage of chapters viewed