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Better e-Learning for Innovation in Education

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Better E-Learning for All Strategic Partnership
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A Systematic Review of Design Factors to Prevent Attrition and Dropout in e-Learning Courses

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Introduction

E-learning's characteristics fulfil the requirements for learning in a modern society and have created great demand from businesses and education (Wu, Tsai, Chen, & Wu, 2006). E-Learning as a learning paradigm is also directed towards Lifelong Learning (LLL) and responds to the challenges of the Europa 2020 strategy, namely in achieving the goals of social inclusion and cohesion (Official Journal, 2011). E-Learning facilitates the access to LLL opportunities to adult learners who prematurely abandon formal education (second chance education). The e-Learning approach is user-centred, is in accordance with the student's needs, availability and specific learning rhythm. This methodology breaks down barriers of time and space. It is anytime, anywhere. It is the ideal situation for those who live far from formal schools, work during the

school opening hours, live with disabilities and cannot relocate to attend school, live in secure institutions, or live with recurring illness.

Worldwide, the e-Learning market has been growing faster than ver (Sun, Tsai, Finger, Chen, & Yeh, 2008), but not without some disappointments (Lencastre, Bronze, Ilin, & Ozonor, 2014). According to Monteiro, Lencastre, Osório, and Silva (2016), one of the biggest setbacks regarding e-Learning is that related to the high rates of attrition (Wang, 2003) that leads to frustration (Wu et al., 2006) (Arbaugh & Duray, 2002) (Thurmond, Wambach, Connors, & Frey, 2002) and to dropout. Dropout rates for e-Learning courses are 15–20% higher than traditional face-to-face courses (Angelino, Williams, & Natvig, 2007).

The problem with high rates of attrition in e-Learning courses has been argued over at length without a clear understanding of what factors contribute to learners dropping out, withdrawing or not completing e-Learning courses. The available research suggests that attrition among adult online learners can be classified into two broad categories: (i) factors related to the learner and his/her context, and (ii) factors related to the course design.

'Better e-Learning for All', an Erasmus+ Strategic Partnership project for adult education, aims to enhance the knowledge about e-Learning as a primary environment for adult education. Thus, the partnership has been studying the e-Learning dropouts and dropout reasons reported in literature in order to identify a suitable 'state-of-the-art' concerning dropout and attrition: this chapter presents the review process and the data obtained.

1. Method

As a methodological approach to gaining the state-of-the-art, the authors followed a systematic review (Gough, Oliver, & Thomas, 2012). A systematic review is a "literature review that is designed to locate, appraise and synthesise the best available evidence relating to a specific research question to provide informative and evidence-based answers" (Boland,

Cherry, & Dickson, 2014, p. 3). Systematic reviews follow well-defined and transparent procedures and always require the following:

1. Definition of the question or problem,
2. Identification and critical assessment of the available evidence,
3. Synthesis of the findings, and
4. The drawing of relevant conclusions.

Systematic reviews aim to find as much as possible of the research relevant to the particular research questions, and to use explicit methods to identify what can reliably be said on the basis of these studies (Gough et al., 2012). Methods should not only be explicit but systematic with the aim of producing varied and reliable results.

1.1. Performing scoping searches, identifying the review question and writing the protocol

As said before, systematic reviews are attempts to review and synthesise existing research in order to answer a specific research / review question. Once a question is formulated, and its theoretical foundations are established, the protocol is written. This protocol describes the steps that will be followed for the review. A protocol describes: (i) the way existing studies are found; (ii) how the relevant studies are judged in terms of their usefulness in answering the review question; (iii) how the results of the separate studies are brought together to give an overall measure of effectiveness. Different questions and different theoretical bases will require different methodological approaches (Gough et al., 2012).

We decided to slightly adapt Boland et al. (2014) nine step systematic review process. While Boland et al. (2014) proposes only one moment for applying the inclusion and exclusion criteria, after screening titles and abstracts and before selecting full-text papers, we argue that having two moments significantly reduces the necessary time for completing the review, especially when having a great amount of initial citations.

The first moment, after literature searching and using Endnote reference manager, quantitative data collected like peer review, published

year, publication type, language will be filtered. That allows a considerable reduction of citations for title and abstract screening, the moment where the remaining inclusion and exclusion criteria will be applied. The following 9 steps will be followed:

1. Performing scoping searches, identifying the review question and writing the protocol;
2. Literature searching;
3. Applying inclusion and exclusive criteria in quantitative data;
4. Screening titles and abstracts;
5. Selecting full-text papers;
6. Quality assessment;
7. Data extraction;
8. Analysis and synthesis;
9. Writing and editing.

The first 6 steps are described in chapter 2 of this paper, step 8 in chapter 3 while step 9 is present in the entire paper, including chapter 4 and 5, Discussion and Conclusion, respectively. Studies included in the review are screened for quality, so that the findings of large studies can be combined. Peer review is a key part of the process; qualified independent researchers control the author's methods and results. For this research, we developed a protocol for the systematic review by following the guidelines and procedures of Boland, Cherry, and Dickson (2014), and consultation with e-Learning specialists on the topic. This protocol specified the review question, search strategy, inclusion, exclusion criteria, quality criteria, data extraction, and methods of synthesis.

1.1.1. Review question

According to our research goals, we established the following review question: "What is the relationship between course design with attrition and dropouts in e-Learning?"

1.1.2. Inclusion and exclusion criteria

Studies were eligible for inclusion in the review if they presented empirical data.

Inclusion criteria:

- Published since 2011
- Reviewed by experts, peer-reviewed (to reduce bias)
- Addresses course design in e-Learning courses and relates with dropout and/or attrition
- Written in English
- Full text

Exclusion criteria:

- Books, book parts, e-books and magazine articles
- Published before 2011
- No original data
- Does not address course design in e-Learning courses and does not relate with dropout and/or attrition
- Not written in English
- Not a full text

1.2. Literature searching

After consulting a specialist, we were given a list of the most reputable databases in Educational Technology:

- ERIC
- ISI Web of Science
- Taylor & Francis Online
- ACM Digital Library
- Science Direct
- SCIELO – Scientific Library online
- B-On portal
- Open Research Online (Open University)

Figure 1 shows the systematic review process and the number of papers identified at each stage. In Stage 1, the titles, abstracts, and keywords of the articles in the electronic databases that have been included were searched using the following keywords:

(1) ("dropout" OR "drop-out" OR "persistence" OR "completion rate" OR "attrition" OR "graduation rate" OR "success rate")
(2) ("distance education" OR "distance learning" OR "elearning" OR "e-learning" OR "electronic learning" OR "computer assisted instruction" OR "virtual classroom" OR "online learning" OR "online course" OR "online education" OR "web-based education" OR "web-based instruction" OR "blended learning" OR "b-Learning")
(3) (("course" OR "units of study" OR "thematic units" OR "subject units" or "instructional") AND ("design" OR "plan" OR "development" OR "creation" OR "evaluation" OR "assessment" OR "quality"))
(4) ("MOOC" OR "Massive Open Online Courses")
(5) 1 AND 2 AND 3 NOT 4

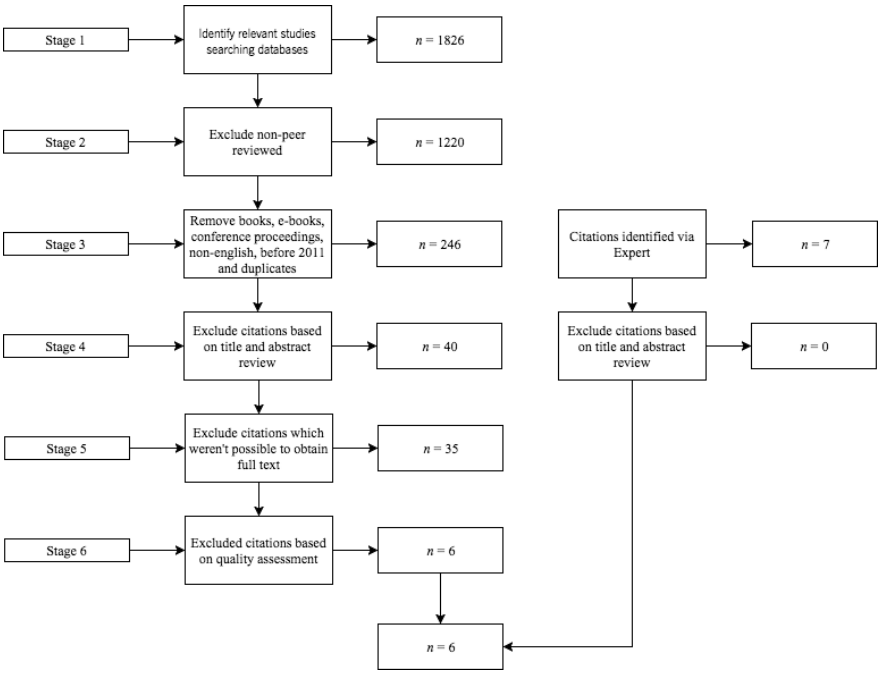

Figure 1 – Stages of the study selection process.

1.3. Applying inclusion and exclusive criteria in quantitative data

After applying each individual search strategy to all selected databases, results were exported and then imported in Endnote X7, using a unique folder for each database. We then looked at each folder for missing record type, author, year and title fields and completed them when required.

Table 1 shows an overview of the results collected on Stage 1, Stage 2 and Stage 3. The data in Table 1 below accord to the criteria stated and number of citations identified in Figure 1 above.

Table 1 – Number of citations found by database and filters.

	Stage 1	Stage 2	Stage 3
ERIC	238	94	14
Web of Science	157	157	38
Taylor & Francis Online	4	4	4
ACM Digital Library	53	22	8
ScienceDirect	24	24	6
SCIELO	4	4	0
B-On portal	985	554	125
Open Research Online	86	86	17
SCITEPRESS Digital Library	275	275	47
Total (N)	1826	1220	259

Total unfiltered results (Stage 1), with no inclusion and exclusion criteria applied, was 1826 citations, while peer-reviewed had a total of 1220 citations (Stage 2). Whenever possible we exported only the results that were peer-reviewed, by choosing that option at the database search. For Stage 3, aggregating most of the inclusion and exclusion criteria resulted in 259 citations.

In Endnote, a smart folder named "1. Stage 3" was created in order to apply as much as possible of the inclusion and exclusion criteria. The following settings were used:

Name	**Description / Settings**
1. Stage 3	NOT 2. Book AND NOT 3. Conf. Proc. AND NOT 4. Non Peer-Reviewed AND NOT 5. Non English AND 6. Since 2011
2. Book	Books, e-books, book parts and book sections Reference type contains the word "Book"
3. Conf. Proc.	Conference Proceedings Reference type contains the word "Conference Proceedings"
4. Non Peer-Reviewed	Publications which are not peer-reviewed Reference type contains "Magazine" OR Journal/Secondary Title is "Commun. ACM" OR Journal/Secondary Title is "SIGCAS Comput. Soc." OR Journal/Secondary Title is "SIGCSE Bull." OR Journal/Secondary Title is "SIGGROUP Bull." OR Journal/Secondary Title is "eLearn"
5. Non English	Publications which are not in English Language containing Spanish OR French OR Korean OR Serbian OR Portuguese (manually added to field at each identified citation)
6. Since 2011	Published since 2011 Year is greater or equal to 2011
7. Systematic and Literature Review	Search for Systematic and Literature Review in Titles and Abstracts Title contains "systematic review" OR "literature review" Abstract contains "systematic review" OR "literature review"

In the next step, we removed duplicates using the Endnote built-in function, then sorted by titles and searched manually for similar and equal titles, as Endnote default settings compare references by Author, Year, Title and Publication Type, so some duplicates come through the Endnote function. A total of 248 unique results were found for Title and abstract screening.

Without this step, and following the Boland et al. (2014) original process, a total of 1826 citations would have to be screened for titles and abstracts, around seven times more than what we had obtained.

The smart folder 7. Systematic and Literature Review allowed the identification of Lee and Choi (2011) literature review, which we would then use in our initial analytical data extraction categories.

1.4. Screening titles and abstracts

An Excel sheet was created containing the title and abstracts for the 248 results. Two articles were removed from the review as they were duplicates that were not identified in the previous stage. Two copies for assessment were made, one for each researcher involved in this process, so no prior knowledge of the assessment was known by any of the researchers in order to prevent decisions based on bias. Each researcher evaluated all 246 titles and abstracts and assigned one of three possible outcomes: 'Exclude', 'Include' and 'Unsure'. The remaining inclusive and exclusive criteria, the ones directly connected with the review question, were taken into consideration.

For the 246 titles and abstracts assessed, the number of observed agreements was 0.587 (58.7%). We also computed the Kappa coefficient, which corrects for chance agreement (Cohen, 1960). The Kappa coefficient for Stage 4 assessments was 0.15, which is characterised as "slight agreement" by Landis and Koch (1977). All disagreements were discussed and resolved by the two researchers, before proceeding to the next stage. As a result of this discussion, 40 citations were considered suitable for further review.

1.5. Selecting full-text papers

Out of the 40 citations, one was in Japanese and therefore excluded. For seven of them, we could not download the full text as they were not Open Access or we did not gain access credentials. For those seven, we asked our project partners for their help at the first phase, about a week after we sent an email to the main authors requesting the citations. After a waiting period of a month, we obtained four results: one of each was a poster and therefore excluded. We also received a citation after the agreed waiting period, so it was also excluded, making a total of 35 citations for the detailed quality assessment.

1.6. Quality assessment

While on the quality assessment process, Researcher 1 exported the list of the final 35 citations from Endnote, using Endnote Export Output Style and saving as XML file type. This file was then imported to nVivo using Data – Endnote: this method insures that data from Endnote – like title, author, abstract, and so on – is imported by adding a memo to each record in nVivo. For the tool, we decided to adapt two versions of the **Critical Appraisal Skills Programme (CASP**), Dyba and Dingsøyr (2008) and Qualitative Research Checklist version 31.05.13 (CASP, 2013).

Researcher 1 started open coding as a way to assist the quality assessment process, but also to save time during a later content analysis. The quality assessment was performed by three researchers for a total of 35 citations using Microsoft Excel and Word. Researcher 1 assessed all the citations, while Researcher 2 did sixteen (16) and Researcher 3 assessed nineteen (19). Results were discussed and the criteria for selection was agreed on citations with only one 'NO' across all the parameters, as none of the citations were answered as 'YES' across all of them. A final number of six (6) citations were selected for content analysis.

Additionally, another seven citations were sent by experts, the research partners, as they believed that these articles could enrich the state-of-the-art (which is in accordance with Boland et al., 2014). For different reasons, all the citations were excluded.

1.7. Data Extraction

After the conclusion of the quality assessment, we started with the data extraction. During quality assessment, there was some preliminary coding based on the study characteristics to assist the process, but also to help understand some trends and tendencies for future data extraction. As mentioned by Boland et al. (2014), this is one type of data needed for a systematic review, descriptive data, the other being analytical data.

As so, we created two folders in nodes at nVivo, one for 'Descriptive Data' and another for 'Analytical Data' categories. For **Descriptive Data** we extracted

- Title,
- Year,
- Author(s),
- Reference type, and
- Research methodology.

For **Analytical Data,** we decided to gather

- Modality,
- Goal/objective,
- Scope,
- Action,
- Results,
- Limitations/recommendations,
- Dropout factors, and
- Strategies to overcome dropout factors.

These were based on the Lee and Choi (2011) review of online course dropout research, covering implications for practice and future research.

2. Results

After data analysis, the results were synthesised in 'descriptive data' (see Table 2) and 'analytical data' (see Tables 3 and 4) on the following pages.

Table 2 – Summary of descriptive data

Short Citation	Full Citation	Ref. type	Methodology
Deschacht (2015)	Deschacht, N., & Goeman, K. (2015). The effect of blended learning on course persistence and performance of adult learners: A difference-in-differences analysis. *Computers & Education, 87*, 83-89.	Journal article	Quantitative
Flynn (2015)	Flynn, A. B. (2015). Structure and Evaluation of Flipped Chemistry Courses: Organic & Spectroscopy, Large and Small, First to Third Year, English and French. *Chemistry Education Research and Practice, 16*(2), 198-211.	Journal article	Quantitative
Gaytan (2013)	Gaytan, J. (2013). Factors Affecting Student Retention in Online Courses: Overcoming This Critical Problem. *Career and Technical Education Research, 38*(2), 145-155.	Journal article	Qualitative
Kalet (2013)	Kalet, A., Ellaway, R., Song, H., Nick, M., Sarpel, U., Hopkins, M., Hill, J., Plass, J., & Pusic, M. (2013). Factors influencing medical student attrition and their implications in a large multi-centre randomised education trial. *Advances in Health Sciences Education, 18*(3), 439.	Journal article	Quantitative
Leeds (2013)	Leeds, E., Campbell, S., Baker, H., Ali, R., Brawley, D., & Crisp, J. (2013). The impact of student retention strategies: an empirical study. *International Journal of Management in Education, 7*(1/2), 22.	Journal article	Quantitative
Robinia (2012)	Robinia, K. J., Maas, N. A., Johnson, M. M., & Nye, R. M. (2012). Program Outcomes Following Implementation of a HYBRID CURRICULUM at the CERTIFICATE LEVEL. *Nursing education perspectives, 33*(6), 374-377.	Journal article	Quantitative

Analytical data was classified in eight categories: (i) modality, (ii) goal / objective, (iii) scope, (iv) action, (v) results, (vi) limitations / recommendations, (vii) dropout factors, and (viii) strategies to overcome dropout factors. Due to the large extent of data collected, we only present the last two categories.

Table 3 – Analytical Data. Summary of (vii) dropout factors

Citation	Evidence	Dropout
Gaytan (2013)	**Course/Program Factors – Institutional Supports** "By "institutional support," experts meant that students must receive adequate support from the educational institution regarding admissions, registration, financial aid, tutoring, programs, policies, and procedures."	Expert knowledge and experience
	Course/Program Factors – Interactions Quality of faculty and student interaction	
	Student Factors – Psychological attributes Self-regulation/self-discipline	
Kalet (2013)	**Student Factors – Psychological attributes** Self-Efficacy, Self-Regulation	Correlated
	Course/Program Factors – Course Design Exam weight of the course overall grade (correlated as weight increased)	
	Student Factors – Psychological attributes Mastery goal orientation Performance approach – goal orientation Performance avoidance – goal orientation	Non-correlated
	Environmental factors – Institutional characteristics Urban/Non-Urban	
Leeds (2013)	**Course/Program Factors – Course Design** Required workload	Student survey

Table 4 – Analytical Data.
Summary of (viii) strategies to overcome dropout factors

Citation	Evidence	Dropout
Deschacht (2015)	**Course/Program Factors – Course Design** Online self-testing Screencast	Increased
	Course/Program Factors – Institutional Support Provide students greater flexibility Establish institutional student support infrastructure	
Flynn (2015)	**Course/Program Factors – Course Design** Repetition of activities every week Structured course format **Course/Program Factors – Institutional Support** Extra, outside class learning support Classroom management experience Facile Access to technical support Establish institutional student support infrastructure	Decreased
	Students Factors – Psychological attributes Student's openness	
Gaytan (2013)	**Course/Program Factors – Course Design** Mandatory self-discipline and time-management training prior to the beginning of an online course Student self-discipline and adequate computer skills screening	Expert recommendation
	Students Factors – Skills Self-discipline Time management Computer Skills Self-regulation	
Leeds (2013)	**Course/Program factors – Course Design** Syllabus quiz Course contract Student services	Neutral
	Course/Program factors – Interactions Email reply Ice Breaker Personal phone call Learning community	

Table 4 (cont.) – Analytical Data.
Summary of (viii) strategies to overcome dropout factors

Citation	Evidence	Dropout
Robinia (2012)	**Course/Program factors – Course design** Embedding of instructional support materials into online modules Gradual addition of online learning applications in a face-to-face environment Iteration based on knowledge and experience	Decreased
	Course/Program factors – Institutional supports Provide staff trainings to qualify them to provide guidance and support in online courses Establish institutional student support infrastructure Universal laptop program Faculty consistency Faculty freedom to (re)design online lessons to meet course objectives Faculty commitment in keeping 50% of content online	

3. Discussion

Out of the six citations, half mentioned dropout factors and five mentioned strategies to overcome dropout factors. Leeds (2013) and Gaytan (2013) were the only citations that had both categories. In Leeds (2013), students were provided with a survey in order to assess the reasons for them not persisting after the implementation of strategies to overcome dropout, while in Gaytan (2013), experts recommended several strategies to overcome their previously pointed factors for dropout.

Only one citation (Kalet, 2013) found a tangible relationship between dropout factors and dropout rates, where correlation was found with two factors, one related with a Psychological attribute of the student, another with Course Design, and no correlation with three Psychological attributes of the student and an Institutional characteristic. As for the other two citations, their results require validation in order to relate them to dropout rates. In Gaytan (2013), a panel of 15 experts identified critical factors affecting student retention in online courses, while Leeds (2013) results were based on a student's survey after they had dropped out.

Out of the ten dropout factors found in three citations, four were related to Course/Program factors, five with Student factors and one to Environmental factors, but only three were correlated or was attributed with the increase of dropout based on empirical evidence. From those three factors, two were related with Course Design: exam weight of the course overall grade (Kalet, 2013) and required workload (Leeds, 2013); and one related with the Students' Psychological attributes: Self-Efficacy, Self-Regulation (Kalet, 2013).

As well as dropout factors, there were strategies to overcome dropout factors that did not produce a positive effect on retention. Deschacht (2015) strategies had a negative impact on course retention, Leeds (2013) strategies had no statistically significant impact, while Gaytan (2013) provided expert recommendations. The other two citations (Flynn, 2015; Robinia, 2012) found that their strategies were successful in reducing dropout/attrition.

All of the 34 strategies used to overcome dropout factors were different; none of the strategies in any of the citations were notably similar to one another.

Of the 12 Course/Program Factors – Institutional Support strategies, two had a negative effect in dropout (dropout increased) and 10 contributed to the decrease of dropout. From the 12 Course/Program Factors – Course Design strategies found, three had a neutral effect (no statistically significant results), two were related with an increase of dropout and five of the strategies had a positive effect in dropout (dropout decreased). All of the four Course/Program factors – Interactions strategies had a neutral effect in dropout, all from Leeds (2013). Finally, there was one strategy related with Students Factors – Psychological attributes, student openness, that contributed to a decreasing dropout.

Conclusion

The diversity of the results obtained can be explained by the wide notion of 'course design' expression as used in the review question. This was intended to explore several possible outcomes and not to over-direct the research or limit the results and their interpretations.

Recovering our review question – "What´s the relationship between course design with attrition and dropouts in e-Learning?", the results showed that there is in fact a relationship. Robinia (2012) and Flynn (2015) were able to reduce dropout rates in blending face-to-face courses and Kalet (2013) found correlated and uncorrelated dropout reasons: these included elements in course design. But some were not that successful: Deschacht's (2015) attempts to blend a face-to-face course led to increased dropout rates and Leeds's (2013) strategies for online retention had no statistically significant impact.

We argue that, based on the results, course design strategies or factors cannot be devised without the consideration of several other aspects, including students and course/program factors. A single measure, an isolated strategy, or a course design change without carefully considering all other factors will be insufficient to reduce significantly existing dropout rates as we cannot assume the causal effect from any of the factors exposed, or the strategies implemented, as none of the authors actually did so. Most refer to the high number of existing variables and the fact that they can only track a few. Some found correlations, others measured the extent to which some strategies affected the dropout rates.

The infinite possible combinations of a student's context and course design in each e-Learning scenario highlights the importance of having models and methods to predict dropout, to assess learning effectiveness and to profile dropouts and completers rather than just simply identify the reasons for dropout. We believe that this finding is as important as understanding the reasons and strategies used to overcome dropout and attrition.

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