



Sapienza

E-learning courses at Italian National Institute of Health: characteristic of dropout participants.

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Health is not everything, but everything is nothing without Health.
(Arthur Schopenhauer)

I dedicate this work to my Wife Francesca Panunzi, for her tireless dedication and unconditional support. To my wonderful boys Ibrahim and Emanuele for their kindness.

Declaration

I declare on my honor, that this doctorate thesis is the result of my personal research and guidance of my supervisor. Its contents are original, and all sources are properly documented in the notes, text, graphs, tables and final bibliography.

I declare that this work was not submitted in any other institution for obtaining any academic degree.



Nordino Ibraimo Sulemane

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List of abbreviations and acronyms

ISS	Istituto Superiore di Sanità
CME	Continuing Medical Education
FAD	Formazione a Distanza
WHO	World Health Organization
SPSS	Statistical Package for Social Science
MOOC	Massive Open Online Courses
PBL	Problem Based Learning
LMS	Learning Management System
FAO	Food and Agriculture Organization of United Nations
Agenas	Agenzia Nazionale Per i Servizi Sanitari Regionali
TNA	Training Needs Assessment
NHS	National Health System
ARCS	Attention Relevance Confidence Satisfaction
CPD	Continues Professional Development
LPM	Linear Probability Model
UNESCO	United Nations Educational, Scientific and Cultural Organization
AMA	American Medical Association
USA	United States of America
EU	European Union

Glossary

Definition and categories of dropouts overall at ISS.

Medical dictionary (2020) defines dropout an individual who matriculates in but does not complete a course of study sponsored by an academic institution. While UNESCO defines dropouts from school the proportion of pupils from a cohort, enrolled in a given grade at a given school year who are no longer enrolled in the following school year. At ISS, dropouts are defined based on the level of completion of the course. They are participants who enrolled into courses, although they failed to successfully complete them.

Dropout participants are divided into three categories as described hereunder:

- **Inactives**

Participants who have enrolled but have never done any type of activity within the course.

- **Lurkers**

Participants who have enrolled but only performed some activities (mainly observational) without ever trying to carry out a certification test.

Etymological definition: a person who lurks, in particular a user of an Internet message board or chat room who does not participate.

- **Abandonment**

Those who have made one or two attempts to carry out the tests, without passing them, and who have left the course without taking advantage of the remaining attempts to overcome the tests.

Executive Summary

Background. Over the last decades, the number of health professionals who participate in Continuing Medical Education (CME) through e-learning, has rapidly grown, due to its flexibility. In Italy, healthcare professionals in active clinical practice are required to keep their knowledge up to date, through this scheme.

One of the most relevant challenges is represented by dropouts. Recent CME studies emphasize the dropout rates between 30% and 60 %.

Since 2004, the Training Office of the Italian National Institute of Health (ISS) provides CME e-learning courses in public health, using Active and Problem Based Learning (PBL) methodology. The aim of this study was to identify characteristic of dropout participants in e-learning courses delivered during the 2017-2019 CME triennium. To understand factors that underline the dropout rate and consequently, hypothesize actions to improve retention and completion rates.

Methods. First we analyzed 21 courses (n= 44.630 participants) within the triennium 2017/19. Henceforth, we chose a single course for retrospective analysis. We ran a linear probability model through Stata 14.2, on age, gender, region, type of profession and occupation. Finally, we developed a matrix, based on the 7 steps of PBL, to identify the critical points of participants withdrawal.

Results. On the triennium 2017/19, we found the mean dropout rate of 34% and completion rate of 66%, with a great variability according to the level of interaction, enrolment modality, and accreditation. Based on five points LIKERT scale questionnaire on participants satisfaction into contents of the course, teaching methodology and platform function, out of 44.630, around 26635 (61.6%) who filled in the questionnaire, expressed their satisfaction (4.57 points out of 5). In the retrospective analysis, out of 11.198 participants, the retention rate was 6356 (56,8%) and dropout rate of 43,2% (n=4842). According to linear probability model, significance is noted on gender and age. Occupation type seems not to have significant differences in terms of retention between freelancers and unemployed compared to employed. Between regions and professions, there is also a variation in retention.

Conclusions. The results shade a light on key variables may be contributing to retention and dropouts, including critical points at the courses offered by ISS. Levels of interaction, gender and age seems to play a key role on participants to withdraw either remain in the course.

Introduction and structure of the thesis

According to World Health Organization (WHO), Continuing Medical Education (CME) is defined as the process of continuous learning by which medical professionals keep themselves updated through acquisition of knowledge, skills and attitudes to maintain professional competency in patient management, health services management and their own professional development (WHO 2010).

The history of CME started in United States of America, back to 1934 (Josseran & Chaperon 2001), when the mediocrity of the initial medical training of physicians was recognized. The first mandatory program for accreditation started in urology. Following the creation of specific and clear guidelines by American Medical Association (AMA). In Italy, the National CME Program was launched in 2002, based on Legislative Decree 502/1992 supplemented by Legislative Decree 229/1999, which had established the obligation of continuous training for healthcare personnel (AGENAS 2014). At annual basis, health professionals have to provide 50 credits or 150 triennially.

Over decades, technological improvements have been a driving force for new delivering models such as distance education (Maisonneuve & Chabot, 2009). Therefore, the number of adult learners who participate in distance education has rapidly grown. Due to its flexibility in saving travel costs and allowing for a flexible time and pace (Park, 2007). Early leavers from these courses is the concerning problem.

Evidence show high dropout rates of 38.1% in continues medical education through e-learning platforms (Margolis et al. 2015), (Cabral et al. 2017), (Colaceci et al. 2017). Reasons that underline the early leaving by participants are extremely individual. However, there are some common factors: learning difficulties, socio-economic problems or lack of motivation, orientation or family and institutional support (Park & Choi, 2009). A study conducted in employees (n=149) taking e-courses regarding their work for improving job skills in Korea, found high association with individual characteristics such as age, ethnicity, gender, employment status, socio-economic group, individual work environment as well as motivational factors (Jun, 2004).

Since 2004, the Training office of the Italian Institute of health (ISS), in line with the methodological approach centred on the learner and teaching interactivity, has started trials of e-learning (Mazzaccara, 2015). The aim was to combine active teaching methods, in particular the PBL, with the tools made available by new technologies, in the context of the thrust towards computerization of healthcare professionals. For ISS, the PBL remodelling process for e-learning has always had its priority objective, the maintenance of the foundation aspects of the method, considered essential lifelong learning for healthcare professionals (Mazzaccara,

2015). This approach enables students to draw upon their prior knowledge and skills, bringing a real-world context in the classroom and reinforces the knowledge through both individual and interactive group work. A review of randomized controlled trials found the online PBL approach as an effective and useful method of delivering continuing medical education (Al-Azri & Ratnapalan, 2014).

The strategy is part of ISS compliance with the provision of its mandate for continuing education on health promotion, disease prevention and the management of health services of the Italian health staff. Public health and medical industry are constantly evolving, so CME is a key to guarantee professional grow and effectively address patient and population's health needs (Ahmed et al. 2013). Understanding why healthcare professionals dropout and do not persist in obtaining their mandatory credits, is critical to improve retention.

The main aim of this study was to identify characteristic of dropout participants in e-learning courses at ISS, delivered from 2017 to 2019 CME triennium. To understand factors that underline the dropout rate and consequently hypothesize actions to improve retention and completion rates. The thesis is organized into 6 chapters.

Chapter 1: Background information of ISS courses

Chapter 2: Problem statement, study questions and objectives

Chapter 3: Methodology and Materials

Chapter 4: Study Results

Chapter 5: Discussion and Conclusions

Chapter 6: Key Recommendations

CHAPTER 1: Background information of courses offered by ISS

The National Commission of active learning has approved the resolution of 14 December 2017, which implements, for the healthcare professional, the tool of the training dossier, which is an expression of the programming of continuous updating over time. In compliance with the consistency of training with respect to the profession and skills profile in daily professional practice. This dossier, following the previous phase of experimentation on an individual level, can also be defined by the group of belonging (health company, federation, order, college or association) of each healthcare professional.

In this case, it must respond to what is expected from its own organization: always taking into account the need for the consistency of training interventions also with respect to the desired individual development profile. It constitutes the tool through which the healthcare professional (or the group to which he belongs to) programs and verifies the training path in the light of professional profile and position, both as an individual either as a group. The training dossier envisions a suitable tool to detect the training needs of professionals, also allowing organized groups to be able to direct the training of healthcare professionals belonging to these groups. The new resolution on the matter, constitutes a real turning point in the planning and evaluation of the training path of the individual or group.

The Istituto Superiore di Sanità (ISS) is a national provider of CME. A system that provides continuous updating for all health professionals. The growing demand for updating has led to a significant increase in the range of distance training courses (FAD), considered a potential response to this emerging need. Evidence of the greater effectiveness of active teaching methods for adults has pushed the ISS, starting from 2004, towards a process of reconversion of Problem-based Learning (PBL), developed for residential training in the health sector (Barbina et al. 2014), towards its remodelling for the e-learning environment. In 2005, the ISS adopted the Moodle platform. Moodle allowed the development of progressive experimentations of the method and the delivery of courses characterized by different levels of interactivity between participants and between participants and facilitators (Barbina et al. 2014).

This system proved to be the most responsive to the specific methodological and technological needs that the PBL-FAD association entailed. All courses have provided ECM, training credits, in line with the national program that, defines the mandatory updating of professional training for healthcare personnel, or university training credits (CFU), (Barbina et al., 2017)). In order to assess its delivery model efficacy, the FAD centre, conducted a study comparing two groups, asynchronous and synchronous paths, for virtual classroom in the master course, on clinical governance for internal medicine: educational

materials and activities were similar for both groups. Findings show that the asynchronous path disadvantaged participants in comparison to their counterparts, attending the synchronous path (Barbina et al 2013). The high interaction model (synchronous) led to high levels of satisfaction among participants, table 1.1.

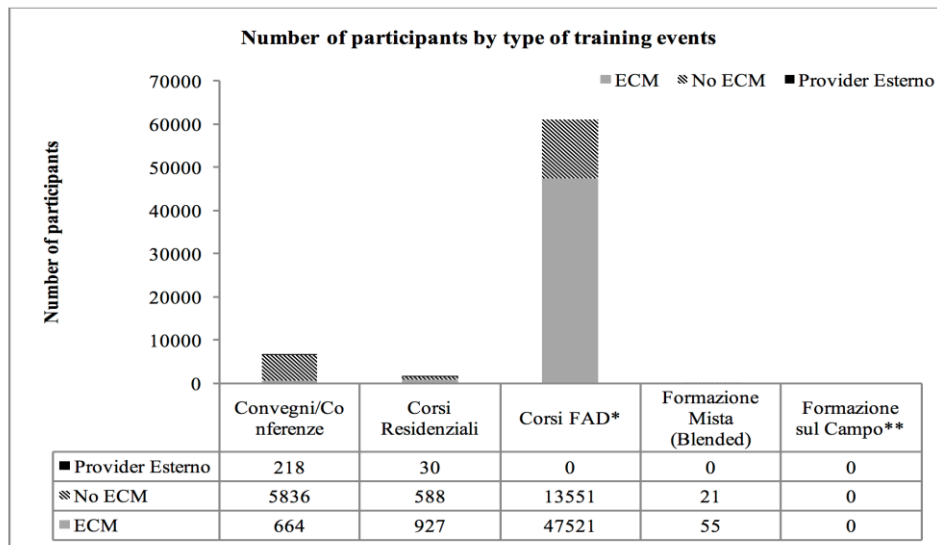
Table 1. 1 Study comparing asynchronous and synchronous models

Individual				
Path	N (questions)	Average	S.D.	
Synchronous	28	4,26	0,2478	
Asynchronous	28	3,69	0,4548	
T-Student	d.f.	Level of significance (P=0.05)		
5,9154	54	0,0000002		
Group				
Path	N (questions)	Average	S.D.	
Synchronous	48	4,5333	0,2301	
Asynchronous	48	3,7796	0,3666	
T-Student	d.f.	Level of significance(P=0.05)		
12,0632	94	0,0000001		

Source: Barbina et al 2013

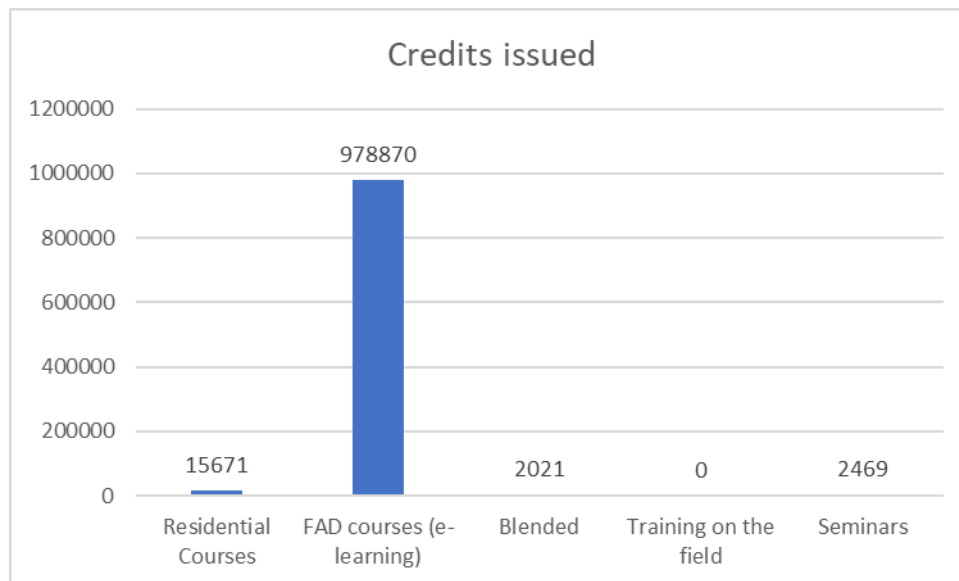
The migration of the PBL into the FAD mode entailed the definition of new paths and tools for learning. The use of the Moodle platform, thanks to its flexibility, availability of tools and underlying philosophy, has given a decisive push to the process of reorientation of the PBL methodology towards a new specificity in the context of the FAD. From 2004 to 2019, the ISS provided about 100 courses, involving about 69,163 healthcare professionals. Participants are part of a wide range of different type of training offered by ISS: Online and residential courses, blended and conferences [Barbina et al, 2014; 2015; Guerrera et al, 2014; Mazzaccara et al, 2013]. The majority belongs to e-learning with 47521 participants (CME), Non-ECM about 13551, seminars around 6500, residential 1515 and blended 76, (figure 1.1). About 1000.031 credits were issued, by which 979.870 on courses delivered online, residential 15671, seminars 2469 and finally blended courses 2021 (figure 1.2). These courses covered the geographical area of the 21 regions across Italy, African context and Balkans peninsula.

Figure 1. 1 Number of participants by type of training



Source: Activity Report Training Office - Istituto Superiore di Sanità

Figure 1. 2 Number of CME credits issued between 2014 and 2019



Source: Activity Report Training Office - Istituto Superiore di Sanità

CHAPTER 2: Statement of the problem, study questions and objectives.

Under the MoH vigilance, the ISS is the technical scientific body that focus in research, trials, control, counselling, documentation and training for public health. Over the last 150 years, Italy has observed an epidemiological transition due to better hygienic-sanitary conditions, availability of vaccines, evolution of medicine and development of innovative drugs. The widespread access to treatments and services for the whole population, consequently, has increased the life expectancy at birth, reaching 82.7 years in 2015, up from 79.9 years in 2000 (Country & Profile, 2019), (The WHO 2017).

Though chronic diseases, cardiovascular diseases and tumors have increased. Data from 2016 alone show, total deaths of 640.000 (WHO 2018). Two thirds of all deaths, are attributed to cardiovascular diseases (40% women and 33% men) and cancers (24% women and 33% man), (Of et al., 2018). Many of these diseases are preventable through intervention on the main modifiable risk factors such as heavy smoking, alcohol abuse, improper nutrition and sedentary lifestyle. In addition to this, reemergence of infectious diseases that were already eradicated pose a serious risk to the local population. To respond effectively to these challenges, skilled health workforce is needed.

The ISS, in compliance with the provision of its mandate for continuing education on health promotion, disease prevention and the management of health services of the Italian health staff, is engaged in providing training for healthcare professionals.

Public health and medical industry are constantly evolving and so health issues. CME is a key trigger to guarantee professional grow and effectively address patient and population's health needs. To equip the healthcare professionals with the right tools, to respond the demand and better support the community. Evidence based on dropout in CME using active approaches such as PBL, show high dropout rate of 38.1% and completion rate of 61.9% (Margolis et al. 2015), (Cabral et al. 2017; Colaceci et al. 2017). Understanding why healthcare professionals dropout and do not persist in obtaining their required credits, is critical to improve retention.

The main aim of this study was to identify characteristic of dropout participants in e-learning courses at ISS, delivered from 2017 to 2019 CME triennium. To understand factors that underline the dropout rate and consequently, hypothesize actions to improve retention and completion rates. In order to do so, were formulated three research questions and objectives respectively:

Question 1: What is the evidence in literature on dropout for e-learning courses in continuing medical education?

Question 2: What are the main characteristics of dropout participants in e-learning courses in Eduiss?

Question 3: Which are the assumptions about the factors most correlated to dropout and what are the strategies to improve the completion rates?

Objective 1: Trace literature dropout data for e-learning courses in continuing medical education.

Objective 2: Describe the main characteristics of dropouts in e-learning courses in Eduiss.

Objective 3: Develop hypotheses about the factors most correlated to the dropout and strategies to improve the completion data.

CHAPTER 3: Methodology: Methods and Materials

To get the overview of dropouts and completers, we retrieved and analysed quantitative data available in the Eduiss platform related to the triennium 2017/2019. With over 43256 participants from 30 different health professions, distributed around the 21 courses, with different type of characteristics: low and medium interactivity, PBL and non-PBL (only 3), workload and registration modalities.

Afterwards, we decided to focus in a single course to be analysed retrospectively. The course run from 18/07/19 to 18/12/19. The selection was based on the characteristics, which partly reflected most of those already analysed in the triennium. In this case, we intended to analyse professional and socio-demographic variables of participants who dropped out at the end of the course.

3.1. Data collection and ethical considerations

We used data available on the platform already consented by participants, based on data protection regulation approved in 2016 by European Union. Before and during the data collection we assured that the procedures do not violate the participants' rights to privacy.

This study by nature, does not subject participants to any physical or emotional harm, so the use of data is only related to the research purpose, not to be shared outside the academic sphere.

3.2. Description of data processing and analysis

Regarding the triennium the data was extracted from the tables of the Moodle database. Retrieved through the Structured Query Language (SQL) system. Exported and sorted out into worksheets of the Microsoft Excel 12.3.0 program. The retrospective analysis was carried out with the statistical software Stata 14.2, which allowed to analyse the wide scope and the large amount of data. Comparing different variables and evaluating their statistical significance.

3.3. Non-Systematic Literature Review

The first step was a quick search on the grey literature. From this engine, studies related to dropouts in continuing medical education using active and PBL were unavailable. To synthesize all available evidence on this issue, a search on other platforms seemed to be appropriate. On PubMed, we conducted literature review on dropouts and completers in e-learning courses designed and delivered similarly to those of ISS. Using key words described hereunder. In addition, we searched other engines: google scholar, science direct and elsevier, through Mendeley database. We chose these platforms due to their unrestricted access.

Studies are peer review and are reliable sources of information. Most of them are free of charge. These databases also provide primary research from health and clinical fields.

(distance learning OR e-learning OR distance education OR online learning OR online education OR web-based learning OR web-based training OR computer-assisted instruction OR computer-aided instruction OR computer-based instruction OR internet-based learning OR multimedia learning OR virtual learning OR technology-enhanced learning)

AND (Continuing Medical Education OR continuing professional development OR Medical Education OR Medical training OR continuous learning OR CME)

AND (Problem based learning OR active learning)

MeSH Terms: education, medical; professionalism; pharmaceutical preparations; learning; medicine; multimedia; education, distance; education; medicalization; education, medical, continuing; computer-assisted instruction; problem-based learning

Subheading: growth and development; education.

3.4.1. Inclusion Criteria

We included E-learning courses using active learning, problem based learning in continuing medical education, with similar characteristics of those delivered at Institute of Health of Rome. We gave main attention to primary studies, to ensure access on quantitative data on retention and dropout rates. Studies were considered if, written in English, Portuguese, Italian or even Spanish.

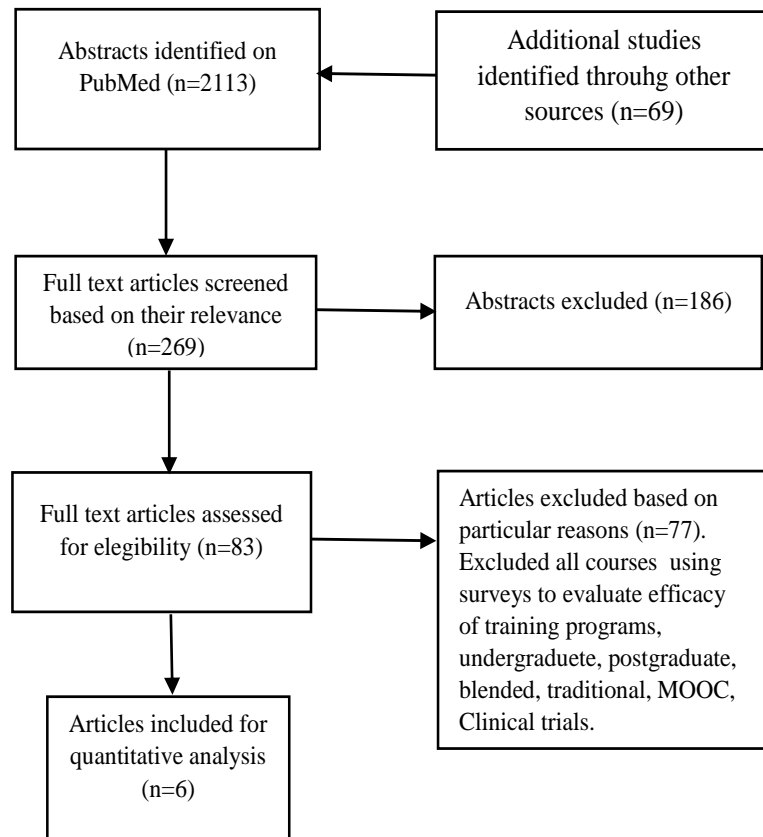
3.4.2. Exclusion Criteria

Were excluded courses using surveys to evaluate efficacy of programs, undergraduate and graduate, non-active learning, blended, traditional and MOOC courses. We also excluded studies not in languages already mentioned above.

3.4.3. Identification and selection of studies

Based on key words and selection criteria, we identified 2113 abstracts on PubMed and 69 on other searching engines. After the screening process, we only retrieved 269 valid abstracts in line with study questions. Breaking it down, we found only 83 valid abstracts to analyze in-depth about dropouts and completers. Only 06 studies were appropriate to include for final analysis. From this number we retrieved and assessed the full text articles.

Figure 3. 1 Flowchart of the study selection process



Source: Systematic literature review studies

3.4.4. Data Extraction

From the articles data were extracted and summarized in assessment template¹, available in the appendixes. The idea was to generate meaningful information to guarantee peer review from other members of the team and finally develop a narrative. We found the template, tailored to meet the needs of our study.

3.4.5. Data analysis and Quality Assessment

Phase I: The first selection of studies, was done by a single professional (the main researcher). Who attributed the colors green, yellow and red, as signs of approval either disapproval. Once done, the other colleagues checked and validated the choices made. Providing written suggestions directly on the searching results folder or discussed in person.

Phase II: Concluded the first phase, final selected articles were once again reviewed by the principal researcher, summarized in the data extraction template

¹ The information contained in the six assessment templates in the annexes, was not censored, it was selected and put as it comes in the original articles, which was to allow the other peers (FAD Team/ISS) to see and evaluate the chosen studies.

described above and shared among other peers for final evaluation. In the extraction template, we clearly mention, the dropout and retention rates after an exhaustive analysis. In some cases, we recalculated dropouts and completion rates. The quality of the studies was mostly based on the course characteristics: type of study, type of intervention, aim of the study, target participants involved. All these characteristics are in line with study questions and characteristic of FAD courses.

3.3. EDUISS platform: methodological characteristics of FAD courses

3.3.1. Characteristic of FAD Eduiss courses

The Eduiss platform is Totara based, a Learning Management System (LMS) designed to provide educators, managers and learners with a single integrated, robust and secure system to create personalized environments.

This advent of technology has enhanced interaction and communication between learners and tutors and amongst learners themselves. Training bodies have moved from a classroom discussion to an online forum, due to easy access and usability of these tools. Learners and tutors can virtually discuss on course related subjects (Zhu 2006). Interaction between these actors is important for quality in distance education. This is emphasized by Alhih 2017, analyzing students to students interaction, students to teachers, students-contents interaction and students interface interaction. He found the different levels of interaction as crucial into motivation and success of students in online education (Alhih et al. 2017).

According to Food and Agriculture Organization of United Nations (FAO), e-learning is a great and cost-effective option to delivery education and training for a wide range of participants, spread into different geographic locations. Also, when learners have limited mobility and time to devote to learning (FAO 2019). The ISS adopted E-learning in 2003. The design and choices took into account the number and type of participants, the characteristics and objectives of the course, which some topics necessarily require interaction. The analysis of the constraints and opportunities, led to outlining three different types of delivery models: Low, Medium and High interaction, table 3.1.

Table 3. 1 Levels of Interaction of courses

Interaction Model	Description	Contents
High Interaction	Low number of participants, small groups with facilitator (5-10), virtual classroom and other interaction tools	Structured, provided by the expert, text (low cost) or multimedia (high cost)
	Participants manageable in groups of 20-30 for each facilitator, asynchronous mode, focus on the individual participant, interaction with the	Structured, provided by the expert, text (low cost) or multimedia (high cost) Individual solution of the participant

Medium interaction	facilitator on some steps of the PBL	
Low Interaction	High number of participants, learning throughout the PBL cycle, asynchronous mode, no facilitation	Structured, provided by the expert, text (low cost) or multimedia (high cost)

Source: EDUISS courses classification

3.3.2. Low Interaction Model

The low interaction at FAD courses, are the result of a rework, according to the distance delivery method, for adult learners (PBL). It represented the strength of the FAD activities, being designed to reach thousands of participants (Barbina et al. 2014). Given this large number of participants, it is not possible to organize trainings in small groups and re-create a collaborative environment. The PBL cycle was however reproduced on the platform, without requiring, participants to produce some activities such as analyzing the problem, identify their own learning objectives and problem solution, which are relevant for PBL cycle (Barbina et al 2013).

Therefore, some activities required on PBL, are not monitored, collected or assessed. Each participant normally follows the course in autonomy. In the PBL for large groups all aspects need to be taken into account, due to its complexity.

3.3.3. Medium Interaction Model

Medium Interaction courses are organized at a reduced number of 10 to 100 participants. The teaching method adopted here as well, was inspired by the PBL which involve all the 7 steps of PBL cycle. The courses are characterized by the presence of a facilitator, who individually supports participants in a maximum ratio of 1/100.

In this interaction model the main attention is given to the motivational process or to the needs of the participant such as definition of the specific objectives and expert feedback on the solution of the problem. Despite the availability of a sharing forum within the course and the participant-facilitator interaction, it was not possible to carry out activities in small groups for interaction between participants and between participants and facilitators due to reduced ratio of facilitators, that's why the definition of medium interaction (Mazzaccara 2015).

3.3.4. High Interaction Model

The high interaction courses are designed to deal with a reduced number of users between 5 and 30 members. The didactic method adopted by the ISS, allowed more faithful reproduction of the principles of learning by problems (Bonciani et al. 2013). By adopting all 7 steps of the PBL to be described further below.

This model, allows each participant to develop his/she own learning objectives, hypothesize the solution of the problem and subsequently share to peer members divided in small groups.

The remote communication tools provided by the Moodle core tools such as: forum, chat, feedback, database, workshop, task, the interaction amongst learners and between learners and facilitators within small groups it is continuously stimulated, thanks to the optimal interaction between facilitator and participants. From this comes the definition of high interaction courses (Mazzaccara 2015).

3.4. Description of PBL at FAD Eduiss

The PBL was first introduced in the undergraduate medical school at Mc Master University in Hamilton, around 1965. Since then, it was gradually adopted in other medical schools in Canada, United States of America, Australia and Europe. There is no a single definition or description of it. According to Howard Barrows (1986), PBL is a method that could have plenty of meanings, depending on the design of the educational method skills of the teacher. While Vernon and Blake (1999) provided one of the clearest descriptions of PBL. For this pair, *PBL is more than a simple teaching method. It is better described as a complex mixture of a general teaching philosophy, learning objectives and goals, and faculty attitudes and values* (Jubien 2005).

The PBL is characterized by the fact that learners study problems reflecting real life context they would face in the professional field work. Secondly, learners identify the new information needed to understand the problems. In order to fill in the gap knowledge, they study individually or along their peers in small groups and supported or guided by a facilitator (Dolmans et al 2005). Educational programs that adopted PBL in CME, modified it based on undergraduate medical model (Jubien 2008). Over the years after its adoption, many studies were conducted to assess its efficacy.

The Problem Based Learning has been widely applied due to its effectiveness for long term retention and application of knowledge (Kingsbury & Lymn, 2008). Some studies show that, medical students after a PBL incorporated in their curricula, are more prone towards research activity, preventive care and diagnostic performance. One of the key aspects in medical practice is the skills in problem solving (Pereira 2015). Educational entities in this field, are increasingly recognising the need of health professionals being able to deal and solve ill-structured problems.

The Italian National Institute of Health has adopted the Problem Based Learning in e-learning, adapting it from active learning in residential courses. The main objective was the maintenance of the fundamental aspects of the method, such as

the seven steps that characterize the PBL cycle table 3.2, considered essential prerequisites for training aimed at healthcare professionals.

Table 3. 2 Cycle of Problem Based Learning

What and Why: Methodology	How: Course Structure – Type of Materials provided by Platform' Tools
Introductory resources	
Introduction and General Objectives: Provide a general overview of the course and its objectives	
	File (format: web page)
Participant guide: Provide all the information necessary to attend the course	Book (format: Totara standard tool)
Entrance test: Self-assessment before starting the course	MCQ (format: Totara Quiz)
PBL Cycle	
Steps 1-5 Analyze the problem; define the problem's focus and answer questions for the activation of prior knowledge.	Problem Exercise (format: Scorm-Articulate Storyline 2)
Formulate learning objectives for self-directed learning.	· Problem presentation with animated slides;
	· Open questions related to the course topics;
Compare the formulated learning objectives with the expert ones.	· Open question related to the learning objectives;
	· Presentation of the learning objectives identified by the experts.
Step 6 Collect study materials using key word, web sites and bibliography;	Supporting materials: key words, bibliography and web sites (format: web pages);
Study the learning materials collected and those provided by the experts in order to fill the knowledge's gaps.	Study materials provided by the experts (format: documents in text format);
	Tutorial: expert presentations related to each learning objective (format: slides presentation commented on by the experts; Articulate presenter 13)

Step 7 Participant compare his/her own problem hypothesis of solution with that provided by the expert.	Problem solution: Expert presentation on a possible solution to the problem (format: slide presentation commented on by the experts; Articulate presenter 13)
Conclusive resources	
Post test	MCQ - same question of the Entrance test (format: Totara Quiz)
Final certification test	MCQ (format: Totara Quiz)
Costumers satisfaction questionnaires	Feedback (format: Totara standard tool)
Certification	Certificate (format: Totara standard tool)

Source: EDUISS course structure

3.4.1. Scaffolding in Problem Based Learning

The term was used for the first time by Jerome Bruner 60 years ago. A Psychologist and instructional designer. Scaffolding in education overall, refers to the process by which teachers model either demonstrate to students how to solve problems and then step back to offer support whenever needed (Greening 1998). Given the nature of PBL that focus in solving ill-structured problems, scaffolding is appropriately applicable. It helps students from what they can do now towards what they will be able to do later to solve a given problem.

Learning resources, technical, organizational, interpersonal, which allow the learner to "find a congenial climate and the most suitable handholds to proceed" (Ranieri M. 2010). In online environment using PBL method the scaffolding process is crucial to motivate participants with activities that do not allow a "transmission" mode. It creates more awareness of the PBL method, the so-called metacognition (Barbina 2019).

3.5. Description of the triennium 2017/2019

The courses delivered between the years 2017 to 2019, are characterized by a series of variables:

- low, medium interaction models.
- open to all professions CME and non-CME,
- workload
- enrolment modality.

3.5.1. Accreditation (CME) and Non-accreditation (Non-CME)

The accreditation system, carried out within the ISS, is followed by a process of revision of the quality of the training process based on the ISO Standard certification 9001:2008, in 23 December 2003, obtained on 23 July 2014. Following an audit carried out by the National Agency for Regional Health Services (AGENAS). The certification of National Standard Provider for ECM events. The Provider Standard certification was than entrusted to the ISS from 27 July 2014.

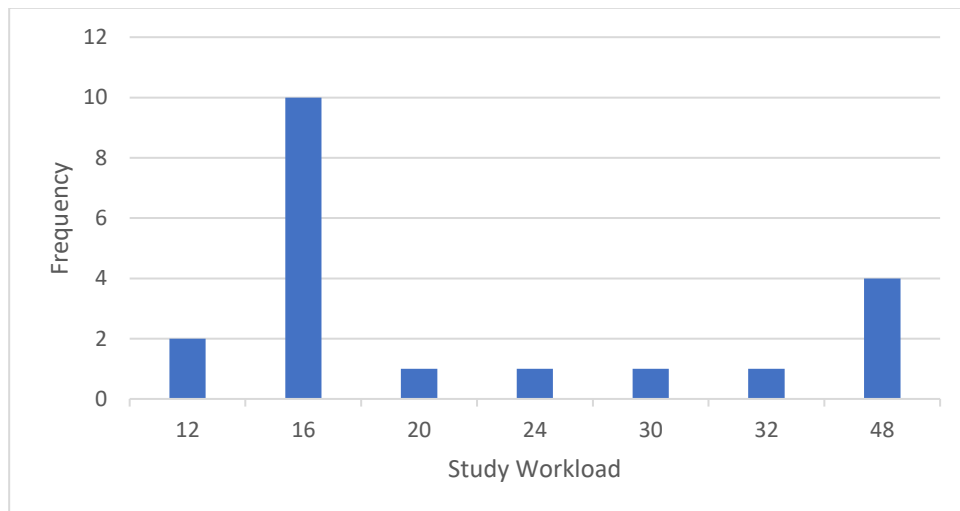
As an entity capable of providing quality in continuous training, in the field of public health and authorized to issue ECM credits (Mazzaccara 2015).

The courses analysed in the triennium were designed aiming to support the creation of a personalized training dossier, to be included in the context of the complex system of the National Health Services. To guide the process of innovation and change of individuals within their professional profiles (Mazzaccara 2015). Learners who required accreditation (credits) was mandatory to pass the certification test (> 75%) at the end of the course. The test contained multiple-choice questions, each question with four answer options, of which only one was the correct one.

3.5.2. The workload of courses at ISS

The workload varied between courses and was comprehensive. Most of the courses consisted mostly of 16 and 48 hours, figure 3.2. The defined workload was aligned to activities and credits within each course. Always following the PBL approach described already. This is a crucial point that ISS consider while developing its courses.

Figure 3. 2 Workload of courses within the triennium 2017/19



Source: Institute of health of Rome

3.5.3. Enrolment Modality

At ISS, enrolment modalities are divided into two categories: Self and project enrolment. Participants are invited to join based on specificity of the course and background of health professionals. Some courses were open to all professions while others were restricted. Enrolment modality has been described as important factor by some studies, but this contrasted by Carmel & Gold. In their study analysing the relationship between enrolment modality and retention of

students in partial online. He found enrolment modality not statistically significant on retention of students (Carmel & Gold, 2007).

3.5.4. Levels of interaction

The courses analysed in this study, were characterized by low and medium interaction. In a total of 21 course, 17 were low interaction. The adoption of this delivery model is due to the need to cover a wide range of health professionals across the 21 regions of Italy. High interaction courses were not included because at the time of the analysis, there was not enough information, meaning that between 2017 and 2019, which is the period covered by the study, there was no any course related to high interaction.

3.6. Description of the chosen FAD course for retrospective analysis

Henceforth the analysis of the triennium 2017/2019, was selected a single course to be analysed retrospectively. The chosen course was Vaccines and vaccination: strategies and tools for infectious diseases prevention and control, due to its characteristics and similarities with most of the courses within the triennium.

3.6.1. Vaccines and vaccination: strategies and tools for infectious disease prevention and control.

The course was available free of charge from July to December 2019. The purpose of the training was to update health personnel on the importance of vaccines and vaccination in the primary prevention of infectious diseases in order to spread the culture of vaccination at the population level (EDUISS data 2019). The course was carried out thanks to active involvement of the various professional figures of the Istituto Superiore di Sanità from multidisciplinary fields: epidemiology, microbiology, immunology, economics, statistics and public health.

3.6.2. Training Needs Assessment.

First of all, it was conducted a Training Needs Assessment (TNA), to identify the needs of the health personnel at the country level. This is a fundamental element to design a course to generate effective teaching and good outcome (Barrow & McKimm 2009). Through rating scale questionnaire (0-7 points) containing 21 questions (n=2081) done within the EDUISS platform. Based on evidence and considering the needs of citizens, were identified the necessary skills to be developed. To achieve effective vaccination coverage, for different infectious diseases preventable through vaccination. To maximize the effectiveness of communication, the contents of the materials produced were subject to an analysis of readability and comprehensibility by representatives of the various professional backgrounds. The design and development of the course was based

in the outcome of the needs assessment. The structure (table 3.3) and core modules described below, are the foundation of the course.

3.6.3. Core Modules of the course

1. Role and functions of vaccines from their discovery at current epidemics.
2. Vaccines offered in Italy and the regulatory provisions regulating vaccination.
3. The critical points related to regional and national vaccination coverage.
4. The risk-benefit ratio, the costs of the vaccine hesitancy and the economic sustainability of vaccination.

3.6.4. General objectives:

- Promote the knowledge on vaccines and national vaccination strategies.
- Provide the right tools to communicate the importance of vaccination.
- Compare the risks and benefits of vaccination.

In order to achieve the main objectives, experts proposed five specific objectives, presented hereunder. In the exercitation part of the course, participants were required to develop their own specific objectives and then compare to those proposed by experts.

Specific Objectives

- Describe the role and functions of vaccines from their discovery to current epidemics.
- Describe the vaccines offered in Italy and the regulatory measures that regulate vaccination.
- Describe the critical issues related to regional and national vaccine coverage.

Table 3. 3 structure and guideline of the course

E-learning course: Vaccine and vaccination: strategies and tools for prevention of infectious diseases		
Struttura dell'Unità/Modulo	Description of the material	Format
Parte introduttiva		
Forum news Gruppo di lavoro Guida del partecipante FAQ	Organized by Training Office	-----
Breve introduzione al corso	Max. 1000 battute introduzione al corso	Word
Questionario valutazione della ricaduta formativa-pre	Domande relative a attitudini e pratiche (8-10 domande) – da concordare	Word
Unità di apprendimento		

Test di ingresso	8-10 domande a scelta multipla: 4 opzioni di risposta, 1 sola corretta Fornire feedback con rimando all'obiettivo di approfondimento	Utilizzare il modello "8_Test formativo"
Problema + Esercitazione su analisi problema e obiettivi specifici di apprendimento	Scenario da costruire sulla base degli obiettivi di specifici, contenente domande stimolo Stesura condivisa con gruppo REI	Problema in word Video ed Esercitazione a cura REI
Support material	Bibliografia (2-3 voci per ciascun obiettivo) Sitografia (2-3 voci per ciascun obiettivo)	Utilizzare i modelli "2_Bibliografia" e "3_Sitografia"
Reading material	80 - 120 pp distribuite tra gli obiettivi (articoli, linee guida, dispense) – liberi da copyright	Per le dispense preparate <i>ad hoc</i> utilizzare il modello "4_Dispensa"
Tutorials	1 tutorial per ciascun obiettivo Per ciascun tutorial 20 slide max. - corredate da note (commento slide che sarà letto durante la registrazione)	Utilizzare modello ppt "5_Tutorial"
Esercitazioni, altri materiali	Da concordare	Da concordare
Problem solution	5-7 slide contenenti un'ipotesi di soluzione del problema	Utilizzare modello ppt "6_Soluzione"
Risorse conclusive		
Post-test autovalutativo	Stesse del test di ingresso	-----
Test certificativo finale	54 domande a scelta multipla: 4 opzioni di risposta, 1 sola corretta Distribuite omogeneamente tra gli obiettivi	Utilizzare il modello "7_Test certificativo"
Questionari di gradimento	A cura REI	-----
Questionario valutazione della ricaduta formativa – post	Stesso del pre	-----
Attestato ECM	A cura REI	-----

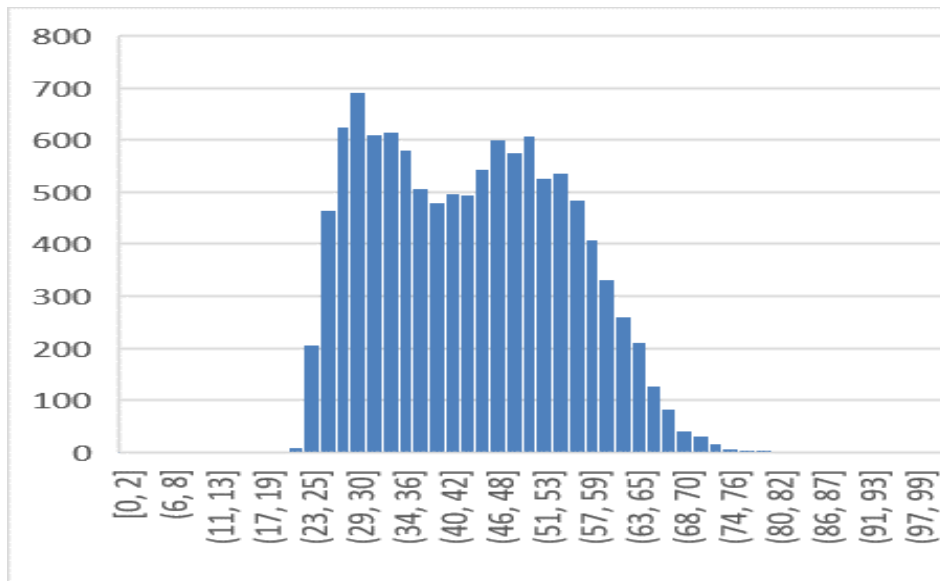
Source: EDUISS

3.7. Characteristics of Participants by gender, age, profession, region, type of occupation.

The majority of participants 7895 (70.5%) were women and 3304 (29.5%) were male. This data emphasises the fact that in Italy women are the major workforce in the context of health. A health system review by the WHO in 2014, found that 64% of health personnel namely nursing, rehabilitation and administration were women (Vicarelli 2015).

Regarding the age distribution of participants, the graph 3.3 shows the distribution of participants by age group with the mean age of 43. Italy has been reported to have the highest incidence of old physicians in comparison to other European countries (Ferré et al. 2014).

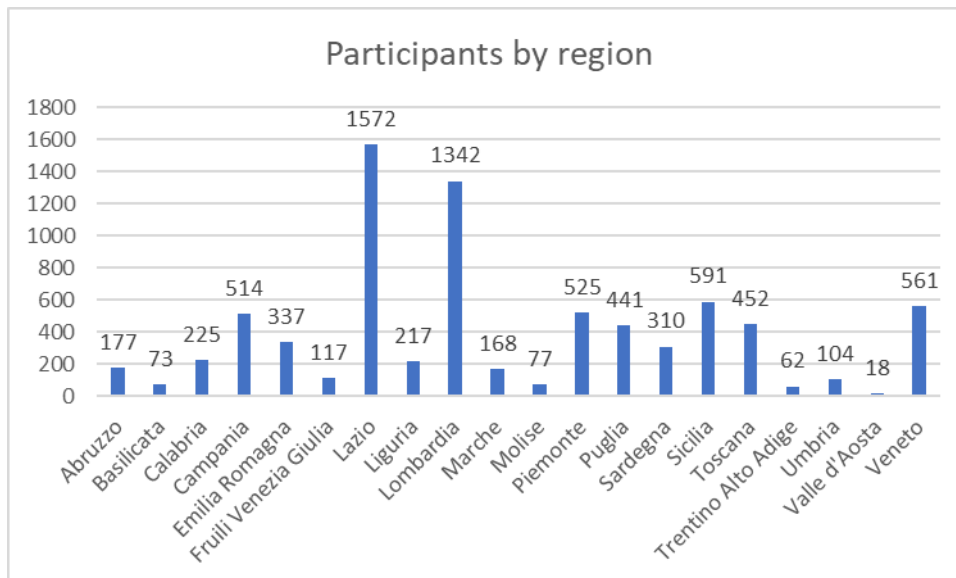
Figure 3.3 Age distribution of participants



Source: EDUISS database

Registered 11198 health professionals from 21 regions of Italy. The gross number of participants were based in Lazio (1572), Lombardia (1342), followed by Sicilia (591), Veneto (561) and Campania (514), and very few participations in the remaining regions (figure 3.4).

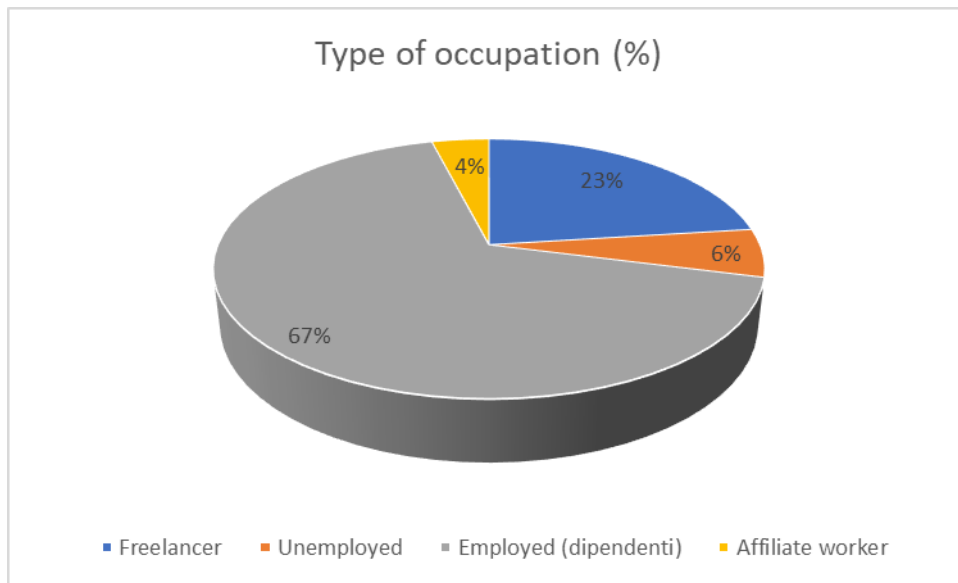
Figure 3.4 Distribution of participants by region



Source: Institute of Health of Rome Database

In the type of occupation, employed made up the majority of health professionals (67%), followed by freelancers (25%), while less influx was observed affiliate workers and unemployed workers, 4% and 6% respectively (figure 3.5).

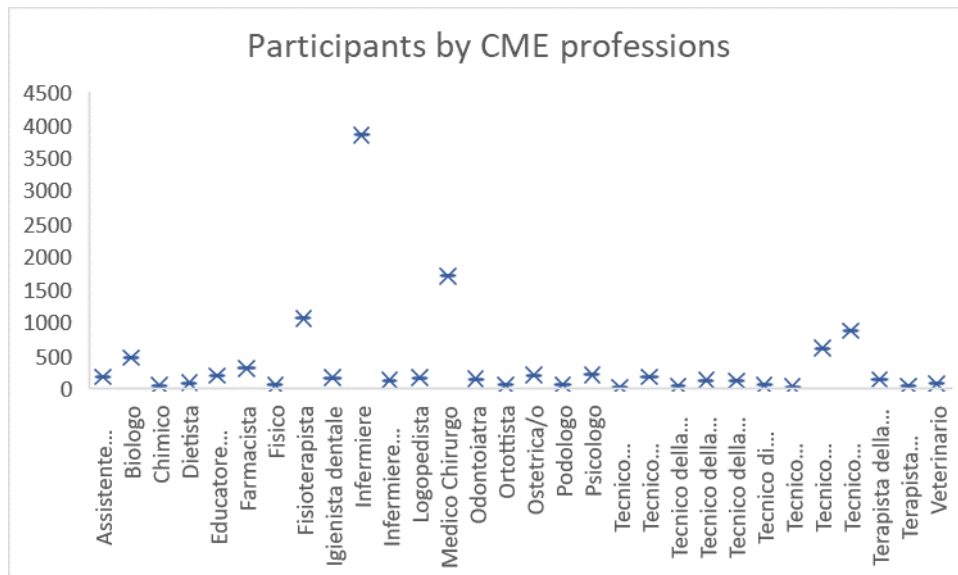
Figure 3. 5 participants by type of occupation



Source: EDUISS database

With about 30 professional backgrounds, there were physicians and non-physicians, from the 21 regions across Italy. The figure 3.6, shows the distribution of enrolled users in the course, by profession ECM. Nurses (3843) and medical doctors (1704) are professions with a large and notable presence in the course. Followed by physiotherapists (1061), and laboratory technicians (869), while other professions presence was marginal. See figure 3.6.

Figure 3. 6 Participants by CME professions



Source: EDUISS Database

3.7.1. Design of the Retrospective Analysis

Based on the outcome of the course after six months (June to December 2019) delivery (table 3.4), we developed a matrix (further below) to analyse the critical points of dropout participants. The matrix strictly followed the PBL steps and structure of the course. Getting a clear picture of where and when participants may have struggled is essential for programme improvements and further design of courses. Likewise, in case control studies we intended to look backwards the course, to determine which variables contributed most to participants dropout. To analyse dropout characteristics on CME using PBL approaches, may be challenging and complex. The triangulation of information are important steps to develop clear hypothesis of the root causes of dropouts.

Table 3. 4 Outcome of the vaccine course

				Total	Percentage
Registered				11098	100
	Inactive			1387	12
	Lurker			2852	26
	Abandonment			603	5
Dropout				4842	43
	Completion				
	Pass			6252	56
	Fail			104	0,9
Completion				6356	57

Source: EDUISS Database

CHAPTER 4: Results

4.1. Findings of literature review

We conducted a non-systematic review to get an in-depth information and knowledge on dropouts in CME non-traditional adult learners on e-learning environment. The strategy meant not to be systematic, although we used and adopted some steps of systematic review for effectiveness of the search. We identified 2113 abstracts on PubMed and 69 on other searching engines such as Mendeley and Google Scholar. After the screening process, we retrieved 269 valid abstracts in line with study questions. Breaking it down, we found 83 valid abstracts to analyze in-depth about dropouts and completers. From these, only 06 studies met the inclusion criteria and were appropriate to include for final analysis. From this number we assessed the full text articles. The six studies presented numerical data on dropout. Some of the studies presenting quantitative data on dropout and completion rates were inconsistent. Based on the information and data available on the data extraction and assessment template², we retrieved available data and proceeded with recalculations, table 4.1. After this process, we found the mean dropout rate of 38.1% and completion rate of 61.9%. The geographic area covered by the studies analysed, comprehend Italy, United States of America, Brazil, Latin America and South Korea.

Table 4. 1 Recalculation of dropout participants in CME specifically

Studies	Before Recalculation		After Recalculation	
	Dropout Rate (%)	Completion rate (%)	Dropout Rate (%)	Completion Rate (%)
1	11	51	19	81
2	33	67	33,3	66,6
3	9	91	39,4	60,6
4	56	48	51,6	48,4
5	32	68	32	68
6	47	53	53,1	46,9
Mean rate			38,1	61,9

Source: Literature review Studies³

4.1.2. Theoretical Framework

Among a variety of models, Sung's model sounds more suitable for the context of ISS and study questions. Although we did not use all the variables presented in this model, it helped to provide guidance. From a perspective of further and

² On the appendix section we also included 4 studies not involved in the retrieved data, but on key factors and models.

³ [Cabral et al. 2017; Colaceci et al.2017; Gupta et a. 2017; Margolis et al. 2015; Luz et al. 2018; Oliveira & Mattos 2017]

in-depth analysis, seems to be an adequate model to adapt from. Which explains the reason of choosing to keep the original form of variables.

The model was adapted by Jun Sung in 2004, while conducting an analysis on 149 adult learners in Korea, related to improvement skills on their professional development context. Sung developed his own model (figure 4.1) based on literature review in adult education, human resources development and online education, and information retrieved from six models: Bean & Metzner, 1985; Billings, 1988; Boshier, 1973; Driscoll, 1998; Keller, 1987; Kember, 1995; Osborn, 2001; Rubenson & Hoghielm, 1978; Vrasidas & McIsaac, 1999.

Bean & Metzner (1985) conducted a study intending to describe the increase of non-traditional undergraduate students including its definition. At the time of the study, causes of dropouts on older, part-time and commuter students were not well understood. Though they developed a model focusing in variables that contributed in the attrition process of these target group aforementioned. The study was conducted at a primarily commuter university enrolling 22.000 students of which 13.000 were undergraduate. They found external factors as the major contributors, compared to social integration among non-traditional students (Bean & Metzner, 1987).

The ARCS model (Attention Relevance Confidence Satisfaction) of motivation was developed by Keller in 1987, driven by the curiosity and desire to find out effective ways to understand in-depth factors influencing learners into motivation to learn as well as systematic ways of identifying and solving issues related to motivation. The model encompasses four dimensions: Attention, Relevance, Confidence and Satisfaction. The author argue that these aspects have to be met for students to be motivated and consequently remain in a given course or training program. Over the years, the ARCS model has been appraised at global level by designers and students due to its assistance in the field of education (Keller, 1987).

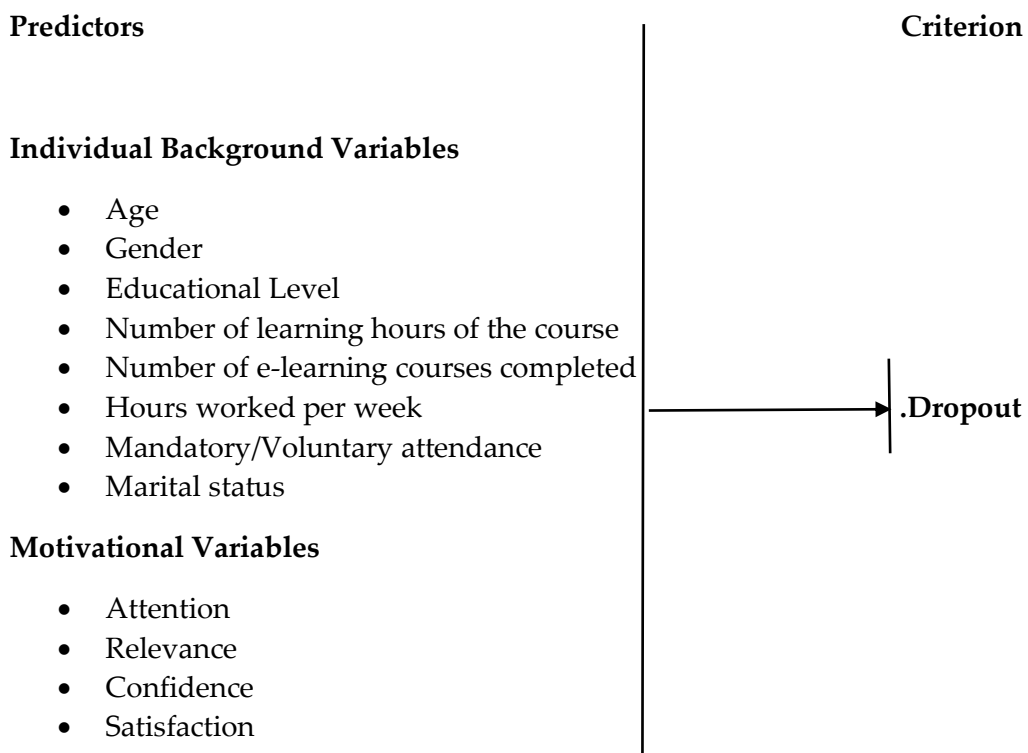
Study from Boshier in 1973 proposed a congruence conceptual framework for adult education participation and attrition. Boshier argued that single explanatory variables are to reject. According to his model, the relationship between congruence and attrition is mediated by social, psychological and institutional variables. To support his study, he analysed data from 2436 students enrolled in continuing education courses without accreditation scheme (Boshier, 1973).

Billings 1988 developed a conceptual model-based Bean's synthetic model containing four variables: Background variables, organizational variables, environmental variables and outcome variables. The variable of intention is used as an intervening one. Billings was guided by the fact that correspondence course attrition have been studied but it lacked conceptual frameworks. In addition, the previous studies on attrition on correspondence were seen as being different from attrition in higher education. The causation was solemnly attributed to students or course environment related. On the Bean's model, Billings added

some variables: background variables to precede organizational and environmental ones and outcome to precede intent. He also added date of submission of the first lesson as the second intervening variable. Billings proposed the measure of the proportion of lessons completed as the depended variable in the final model (Billings, 1988).

The Kember model encompasses four key constructs: Social Integration, external attribution, academic incompatibility and background characteristics. In order to evaluate the efficacy of the model he tested it using path analysis. He found the model was robust enough which accounted for 80% of variance in adult students' persistence.

Figure 4. 1 Sung's logistic regression Model



Source: Sung's study of factors affecting adult learners in online courses

Findings from Sung's study, suggest that individual and motivational variables including satisfaction, are factors highly associated with dropouts on adult learners in CPD scheme. Amongst these identified determinants, confidence is the most substantial factor to predict the dropout of adult learners in work-related e-learning courses. Studies are unanimous in arguing that those who score higher on the confidence measurement scale, are more likely to finish a course than those who scored less (Jun, 2004), (Park & Choi, 2009). Other important variable is relevance, which was also mentioned on Park & Choi 2009 study. Relevance is key for learning and it may be linked to attention. Once learners perceive that a content is interesting and worth knowing to them

(Robenson 2013), they may be more interested, engaged and motivated on the matter.

4.2. Results of the analysis of the triennium 2017/2019

On the triennium 2017/19, we found the mean dropout rate of 34% and completion rate of 66%, with a great variability according to the level of interaction, enrolment modality, and accreditation.

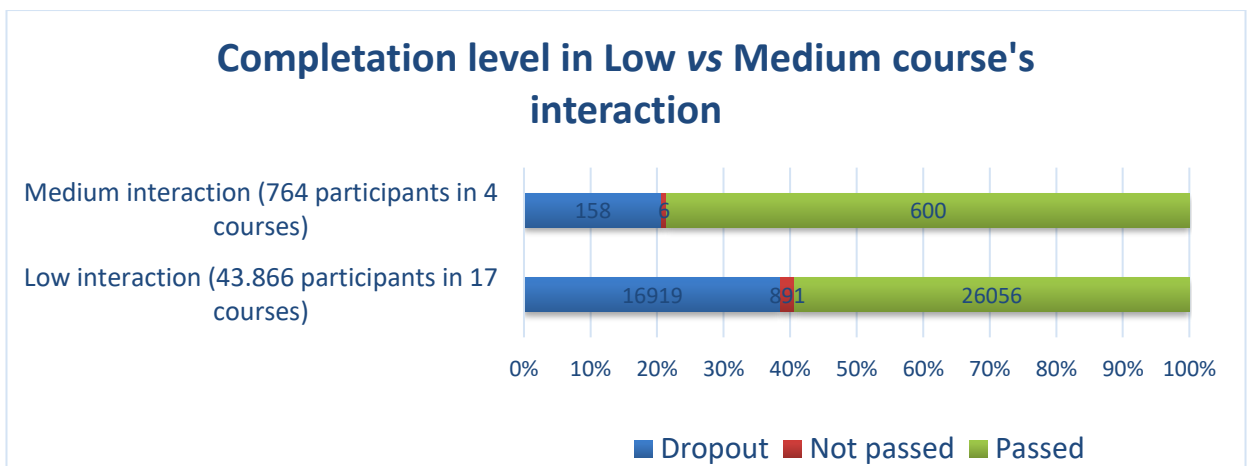
A study conducted by Ludwig & Dunlap, described many factors contributing to participants dropping out, but found the level of interaction in the top. In their study, some participants reported feelings of isolation in e-learning courses, lack of self-direction and management which consequently, decreased their motivation (Ludwig-Hardman & Dunlap, 2003). This argument is also supported by (Bennett, Priest and Macpherson, 1999; Harasim, Hiltz, Teles and Turoff, 1995), which they pointed out that consistent issues associated with e-learning environment is a sense of isolation due to lack of interaction of students with other peers, either tutors. Moreover, students who dropped out lacked self-directed skill, self-discipline, ability to work alone. Interactions have been described key in high quality on e-learning. Shade & Garrison 1990 in their study, state that "interaction is education at its most fundamental form" (Su et al., 2005). Another study conducted by Palloff & Pratt (1999) found that interactions among students themselves, learners-tutors, are the key components in e-learning process. Moore 1989, state that increasing interaction between learners and tutors can contribute reducing the gap on physical separation, leading into effective learning. It may also improve learning outcomes and satisfaction from courses participants (Moore, 1989). Regarding accreditation scheme, were observed slightly differences in terms of percentages between participants who required CME credits and Non-CME (38%, 39%) respectively. The workload seemed not to have implications for completion of the 21 courses analysed. At ISS, course activities and the workload are very well developed and clearly defined to allow participants perform the duties accordingly. All the process has to be in line with the Italian accreditation body AGENAS requirements (Mazzaccara 2015). Finally, project modality (30%) seems to have lower dropouts compared to self-enrolment modality(38.9%). Around 8 courses were reserved to a specific target group, while the remaining 13 were open to a wide range of health professions. There are many studies evaluating the relationship between voluntary vs mandatory participation in how it affects the motivation and training outcomes of participants. Among these studies, one group support voluntary while others support mandatory. The third group suggest that not of the enrolment modalities have a significant role on training motivation and outcome. Dysvik & Kuvas (2008), found zero correlation between mandatory and voluntary enrolment modalities with activities performance within courses (Gegenfurtner et al., 2016).

At ISS participants are classified as completers who passed (>75%) the final certification test, failed who did not get the pass mark. While dropouts are participants who may withdraw any time after starting the course.

The graphs below show the levels of completion, dropout and failures. In the level of interactions (Fig 4.3), medium interaction courses 764 participants, distributed in 4 courses, 600 completed successfully, while 6 failed and 158 abandoned the course. In low interaction courses, out of 43866 participants enrolled in 17 courses, 26056 completed successfully, 891 reached the end but without success and 16.919 left the courses.

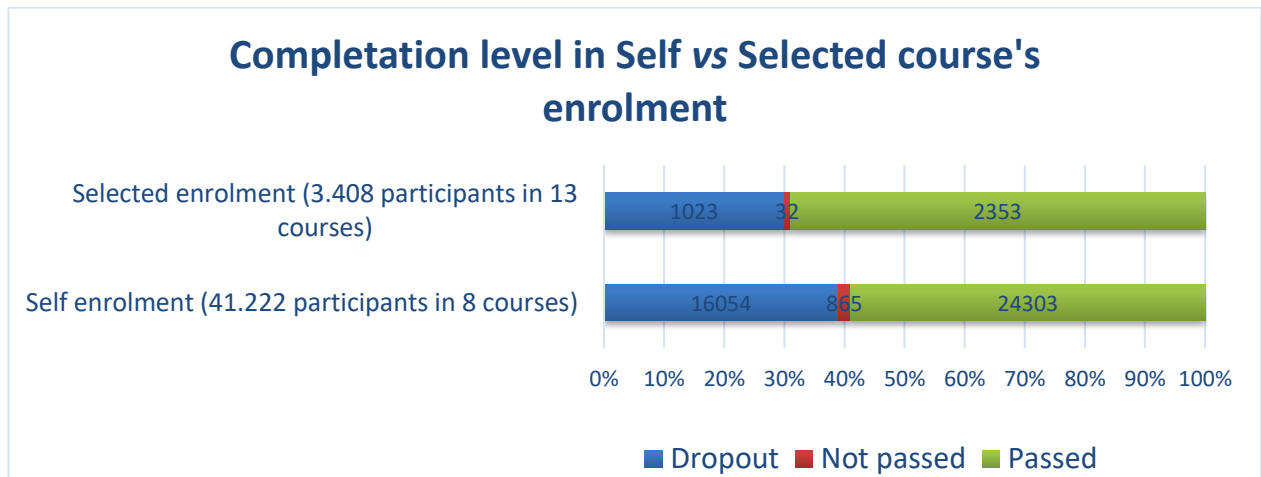
Regarding to the modality of participation in the courses (Fig 4.4), the data show that a project with 3408 participants in 13 courses, 2353 successfully completed, 32 failed and 1023 dropped out. For the voluntary participation of 41.222 participants in 8 courses, 24,303 successfully completed, 865 failed and 16.054 abandoned the courses. Based on the accreditation scheme (Fig 4.5), participants who required credits (CME) at the end of the course, out of 43.378 enrolled in 18 courses, 25.925 successfully completed the courses, 875 failed and 16.578 were unable to proceed to the end. Non-CME with only 1252 participants distributed in 3 courses, 731 completed successfully, 22 failed and 499 dropped out.

Figure 4. 2 Completion by level of interaction modality



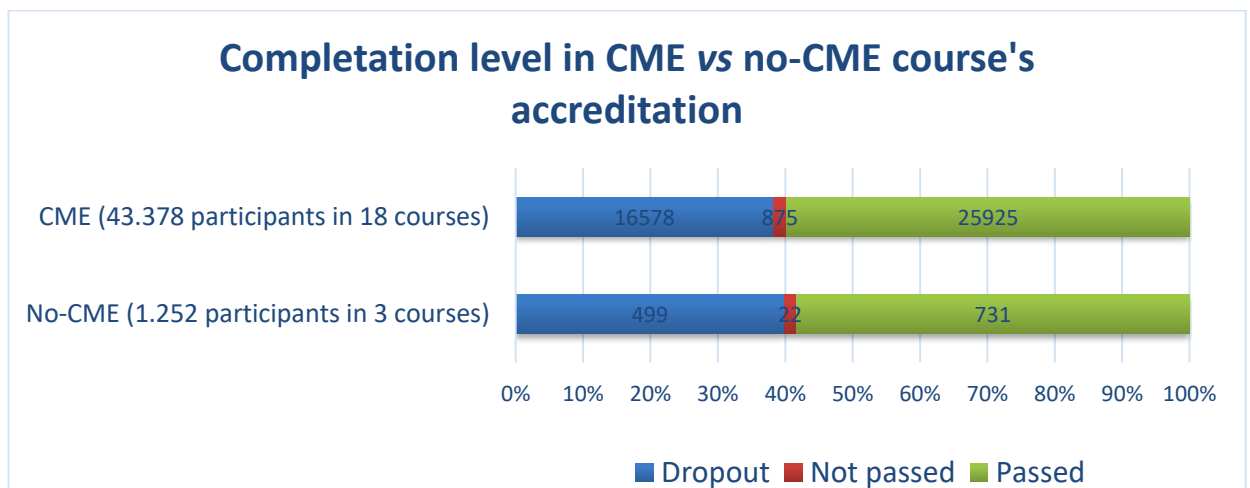
Source: Institute of Health of Rome database

Figure 4. 3 Completion by enrolment modality



Source: EDUISS Database

Figure 4. 4 Completion by accreditation modality



Source: Institute of Health of Rome Database

Based on the needs of the study, we retrieved data from the participants who completed and compiled the satisfaction questionnaires of each course. For this category, 18 courses were accessed instead of 21 (Total analysed in this study), because some comprised two courses together. Therefore, of the 43.256 participants, 26.635 (61.6%), completed the satisfaction questionnaires. On average the questionnaires contained 20 questions on: Course Contents (8), Teaching Methodology (7), Technical Support (3) and 2 Open Response. The 18 questions were based on 5 level LIKERT scale:

- 1= I don't really agree
- 2= I don't agree or disagree
- 3= neither agree nor disagree

- 4= I agree
- 5= I fully agree.

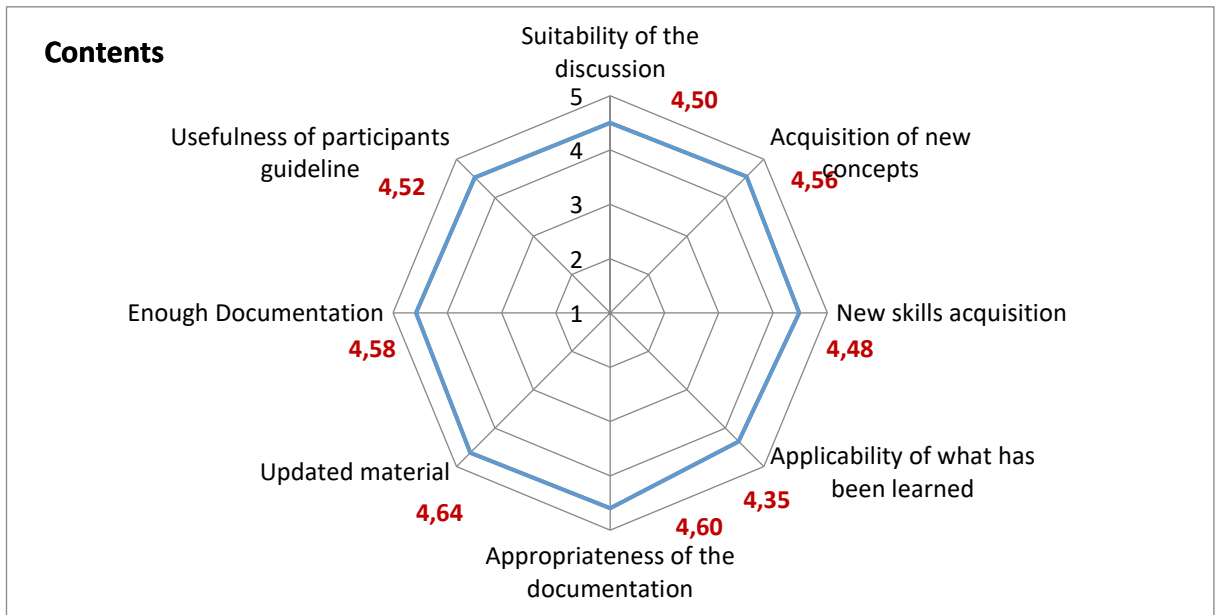
Assessment of participants satisfaction into their experiences and perceptions of the training process after the courses, is a routine practice of the FAD department. To gather information and constructive feedbacks from participants to understand how they perceived support on the training process at technical either, human level. Additionally, it may serve as quality assurance for further development and design of course. This argument is supported by Daniel et al. (2017), "*An institution can achieve success only by understanding and fulfilling the needs of customers*". Over the years assessment methods of e-learning systems for adult learners have been described as critical issues in practice either in research (Wang, 2003) Trentini, 2009). The leading argument is that the value of an e-learning system or training cannot be used only a single item scale, but a combination and confrontation of different aspects of e-learner satisfaction to become a useful and reliable diagnostic instrument (Wang, 2003).

According to the fig 4.6, updated material (4.64 points), appropriateness of the documentation (4.60 points), enough documentation (4.58 Points), scored higher compared to usefulness of participants guidelines (4.52 points), suitability of the discussion (4.50 points) and acquisition of new concepts (4.56 points). The lowest scores were observed in new skills acquisition (4.48 points) and applicability of what has been learned (4.35 points). In the context of dropouts, this last point may highlight dissatisfaction from participants, which may have led to someone withdrawal. A study comparing dropouts and completers in e-learning courses through two constructs: locus of control and satisfaction with e-learning, found that participants who dropped out, were less satisfied with e-learning methods compared to those who completed courses. In addition, the same author hypothesized that difficulties faced by a participant who completed the course, may have been the cause to some dropping out (Levy, 2007).

On the teaching methodology site, figure 4.7, consistency of contents (4.69 points), clarity of objectives (4.67 points) and quality of tutoring (4.63) scored slightly higher compared to effectiveness of the methodology (4.58 points), satisfactory organization (4.54). While appropriate test length (4.52 points) and clarity of the test (4.36 points) are the categories with the lowest scores.

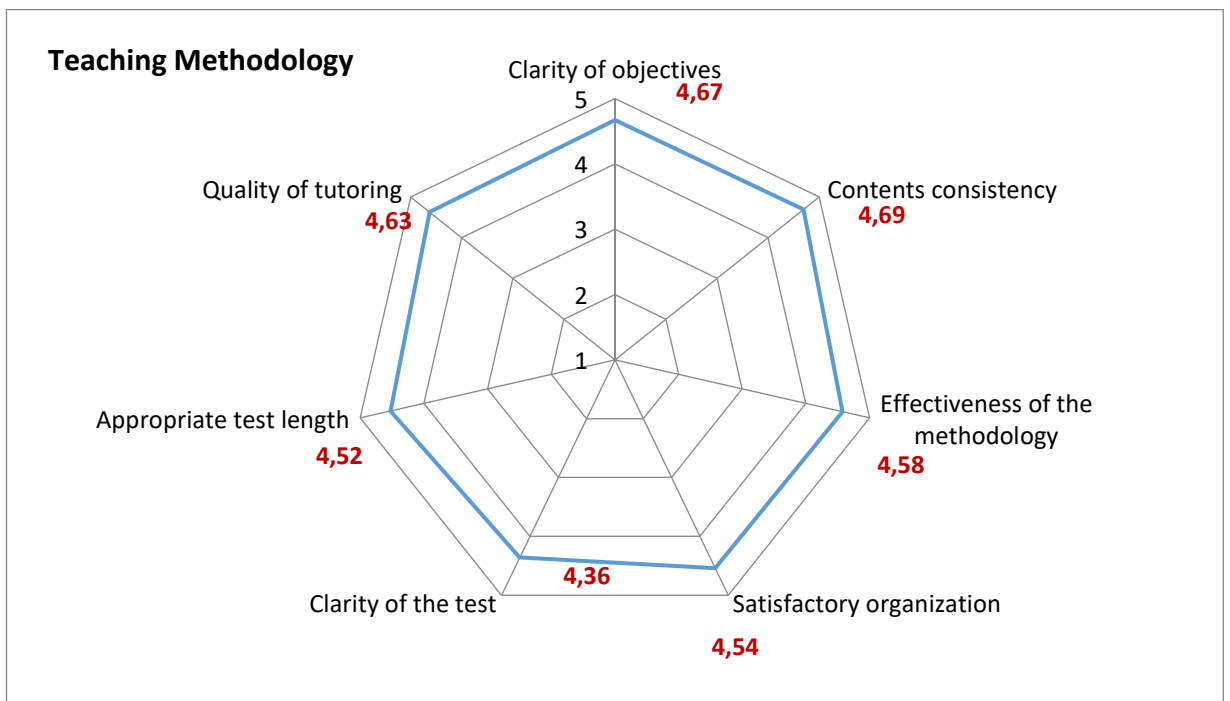
Finally, on the platform figure 4.8, results show quality of technical support (4.62 points) is the highest point scale compared to easy access to platform (4.60 points) and platform functioning (4.60 points).

Figure 4. 5 Participants satisfaction on contents



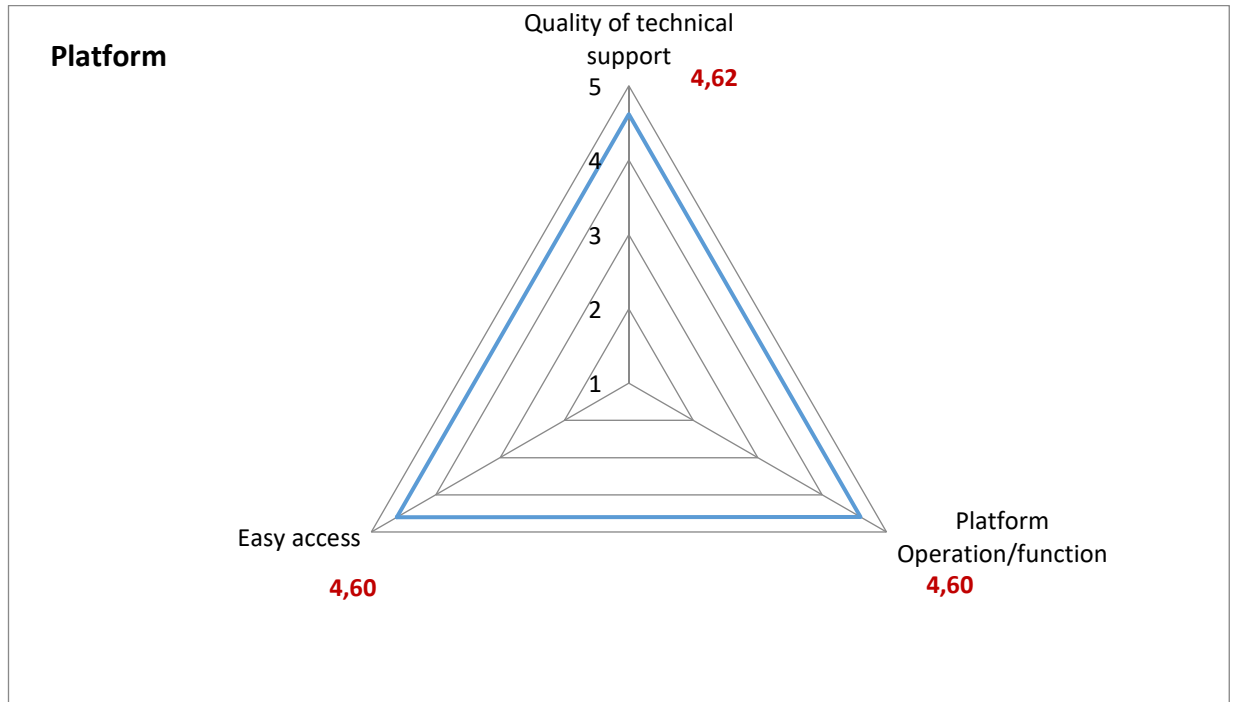
Source: EDUISS Database

Figure 4. 6 Participants Satisfaction on teaching methodology



Source: EDUISS database

Figure 4. 7 Participants Satisfaction on platform operation



Source: DUIS database

4.3. Results of the retrospective analysis

Out of 11.198 participants the retention rate is 6356 (56.8%) and dropout rate is 4842 (43.2%). In this analysis we used a linear probability model to estimate variables contributing on retention of participants in the chosen course. The linear probability model (LPM) has been described as a special case of binary regression model, commonly used in social sciences (Long, n.d.). In this type of analysis, the dependent variable (outcome) for each observation may take values which are either 0 or 1. However, in the LPM framework the relation between the binary dependent variable and the explanatory variables is studied by means of a standard linear regression model. This makes it easier and more intuitive the interpretation of the coefficients, but it presents the drawback that the estimated coefficients can imply probabilities outside the [0,1] interval.

The variable we were interested in modelling was retention into the chosen course, with a variety of explanatory variables: age, gender, employment type, region and type of profession.

The model can be expressed in the following way:

$$Retention_i = \beta_0 + \beta_1 age_i + \beta_2 gender_i + \beta_3 employment_i + \beta_4 region_i + \beta_5 profession + \varepsilon_i$$

where i indicates the individual, β_0, \dots, β_5 represent the coefficients of the selected explanatory variables and ε is the error term.

Data from the LPM analysis show a statistical significance on gender variable and age (p-value<0.05).

On age category (Range= 53) participants were more likely to remain compared to the younger participants. Based on the analysis, it showed that one-year increase in age is associated with a 0.2 percent higher probability of remaining in the course. Some of the categories of the employment type variable also seems to be associated with retention: freelancers and affiliate workers present lower probabilities of remaining in the course compared to employed contract (dipendenti). No significant differences emerge for what concerns unemployed and other type of employment. Among the 21 regions and 30 professions, there is a great variability. Concerning the regions, we use Lazio as the reference category, and we notice that the individuals from the regions of Lombardia, Piemonte and Valle d'Aosta show higher probabilities of retention with respect to individuals from Lazio, whereas participants from Basilicata and Calabria present lower probabilities of retention compared to Lazio. Regarding to professions, Biologists and Pharmacists were more likely to remain into the course compared to nurses.

Table 4. 2 retrospective analysis of vaccines course

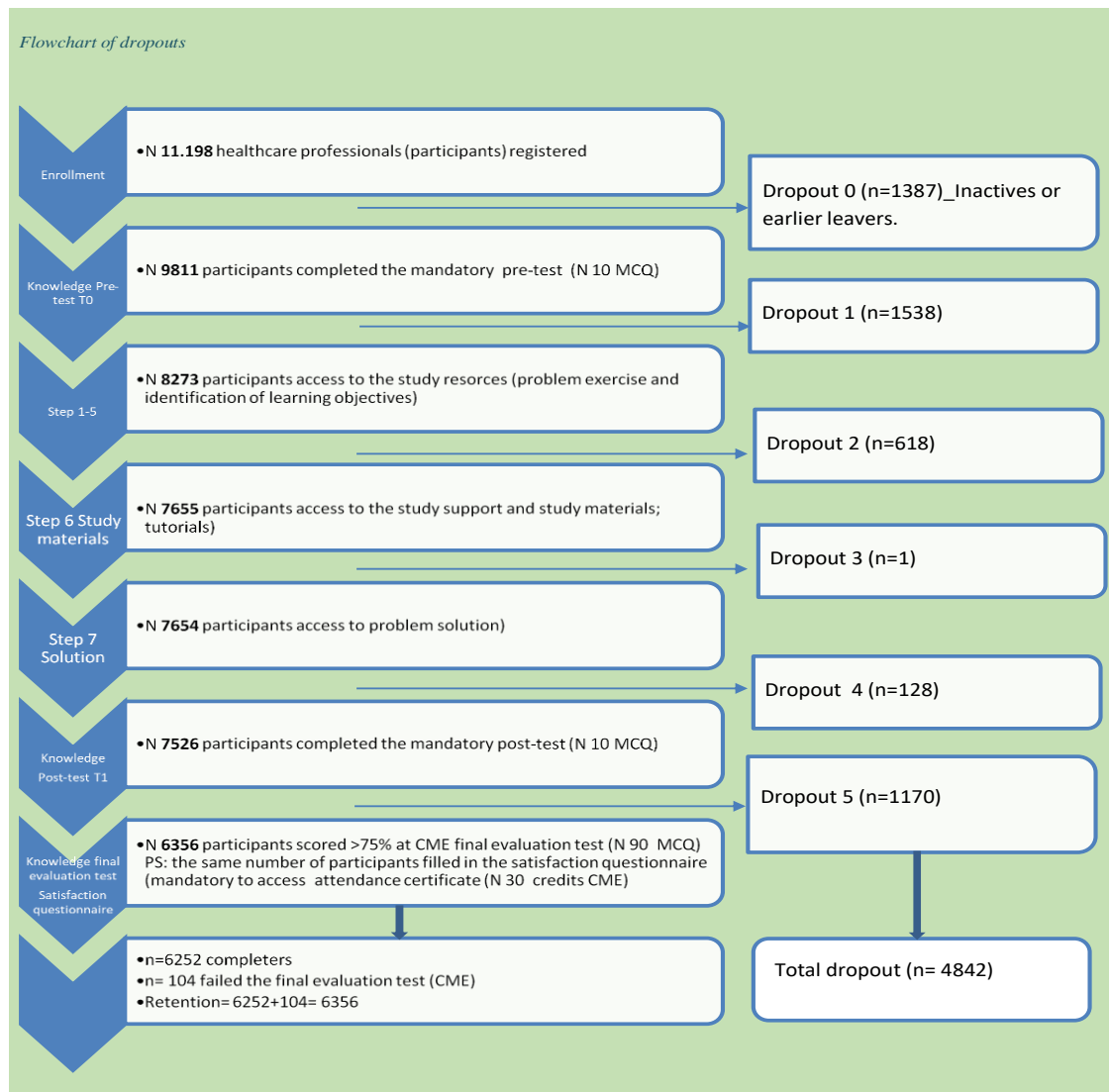
Retention	Coef.	P> t	Retention	Coef.	P> t
2.sesso	-0,0264	0,017	situazione_lavorat.		
age_2019	0,002363	0	1. Altro	0,050982	0,856
			2. Convenzionato	-0,06738	0,011
Professione			4. Libero Prof.	-0,0332	0,014
1. Assistente ..	0,10457	0,011	5. Disoccupato	0,018827	0,385
2. Biologo	0,197217	0			
3. Chimico	0,18939	0,007	Regione		
4. Dietista	0,129312	0,028	1. Abruzzo	-0,04312	0,228
5. Educatore p..	0,167243	0	2. Basilicata	-0,12882	0,012
6. Farmacista	0,00414	0,899	3. Calabria	0,045398	0,121
7. Fisico	0,1717	0,008	4. Campania	-0,04943	0,02
8. Fisioterapi..	0,199237	0	5. Emilia-Romagna	0,028237	0,289

9. Igienista d..	0,077481	0,077	6. Friuli Veneto	0,040501	0,314
11. Infermiere..	0,115886	0,014	8. Liguria	-0,00189	0,951
12. Logopedista	0,191611	0	9. Lombardia	0,053548	0,001
13. Medico chi..	0,105221	0	10. Marche	-0,02227	0,517
14. Odontoiatra	0,181636	0	11. Molise	0,064892	0,159
15. Ortottista..	0,270606	0	12. Piemonte	0,055293	0,01
16. Ostetrica/o	0,079142	0,034	13. Puglia	-0,02548	0,275
17. Podologo	0,283358	0	14. Sardegna	-0,04987	0,082
18. Psicologo	0,219066	0	15. Sicilia	-0,01378	0,491
19. Tecnico au.	0,164746	0,124	16. Toscana	-0,01004	0,665
20. Tecnico au.	0,254903	0	17. Trentino A..	0,037164	0,503
21. Tecnico de.	0,282276	0	18. Umbria	-0,02206	0,606
22. Tecnico de.	0,196993	0	19. Valle d'Aosta	0,197303	0,009
23. Tecnico de.	0,219274	0	20. Veneto	0,037076	0,079
24. Tecnico di.	0,041457	0,601			
25. Tecnico or.	0,270039	0	_cons	0,469825	0
26. Tecnico sa.	0,07564	0,001			
27. Tecnico sa.	0,151114	0			
28. Terapista .	0,246309	0			
29. Terapista	0,13194	0,157			
30. Veterinario	0,166361	0,007			

Based on the matrix below (4.9), many participants were lost at earlier and later stages of the course. Earlier leavers 1387 (12.4%), shortly after the T0 1538 (13.7%), after the post-test (10.4%).

There are conflicting views from studies. Some argue that participants may withdraw at any point of the course depending on personal motivation (Bawa, 2016). While others hold the vision that at later stages of a course, participants are less likely to leave considering the hard work already done, especially for who needs CME credits.

Figure 4. 8 Matrix of dropouts in the course



Source: EDUISS data

CHAPTER 5: Discussion

5.1 Discussion

The literature review from CME studies shows a range of dropouts between 30-60%. Although these data is not easily found because is not clearly reported within the studies. The authors tend to describe higher rates of retention and completion. To get an overview about the average of dropouts, it was necessary to extract and compare the data available in the studies mentioned above. This allowed to perform the calculations accordingly.

In the context of courses delivered at ISS, many factors are contributing to the retention of participants either dropping out in courses. Findings suggest that relevance of the contents of the course, gender, age are key variables leading to health professionals withdraw either remain in courses. Even if in this study we didn't analyse the motivational aspect of dropping out, the predictor factor, part of Keller (1997) on his ARCS model, appraised at global level by designers and students due to its useful utility. Relevance has been described in many studies, as the crucial driving force into motivation of adult participants in e-learning. Once learners perceive the contents are worth knowing and directly applicable to their daily basis, will engage in the process of learning. Therefore, it may have been detrimental on participants motivation. On the other hand, however, the ones who do not see any applicability on personal either professional aspirations may be tempted to withdraw from the course. This is an important point considered when it comes into courses offered at ISS. Health professionals in clinical practice, have to directly deliver the acquired knowledge in real world to provide better outcomes in patients or at population level. Our study clearly shows the high level of satisfaction from participants overall. Which may have contributed for high rates of the retention. Data from the LPM analysis show a statistical significance on gender variable and age (p -value <0.05). Despite that female participants represented 70.5% of the cohort, they were less likely to remain in the course compared to their male counterparts (for women, the probability to remain in the course is 2.6 percent lower than for men). In many studies, (Rovai 2003, Bean & Metzner 1985, Park 2009), external factors such as scheduling conflict, family issues, managerial support, have been described as the main predictors of adult participants dropping out in online trainings (Park & Choi, 2009).

While age seems not have affected performance within courses. Older participants were more likely to remain in courses compared to younger participants. Many studies have explored this issue, guided by the continues stereotype on age in e-learning environments. The results have shown that age does not have much influence on training. Such factors that frequently undermine adult participants to

dropout are external (scheduling conflicts, family issues, financial problems, managerial support and personal issues such as health) and internal (social integration, academic integration, technology/technical and usability issues and lack of motivation) factors combined.

Levels of interaction were also found as one of the contributing variables. Among the low and medium interaction courses (20.7%), the low interaction presents the highest dropout rates (38.6%). The role of a tutor in PBL e-learning is essential. It ensures that participants are engaged on activities, provides them clear guidance on what needs to be done. These actions may contribute to the participants not feeling isolated and also feel more motivated.

Another important factor found to contribute significantly on retention of participants in this study was type of profession. This category in some models (Park 2007), is normally placed on factors related to learner characteristics prior to the course either individual background characteristics. This variable has been described as key influencer on decision to remain either withdraw the course. At ISS courses are taken by multidisciplinary participants which for some profession may be challenging to be engaged into course.

From the flowchart is clearly visible where many participants dropped out (earlier and later stages of the course). Earlier leavers are one of the major concerns at ISS, because they register but never start courses. The hypothetical reason of this participants withdrawal may be that they were not aware about the participants guidelines located in pre-registration on the top of the course. Those guidelines are useful tools and bring up key information, steps on how the course will unfold and what is expected from participants within the process.

The ones who are able to enter and start the course, have struggled shortly after the entrance test, failing to proceed into further activities. At the final stage more participants were lost after the post-test. They may have unsuccessfully carried out attempts to succeed in the certification test, therefore leading them to withdraw due to its demand. There are two conflicting views on the withdrawal of course participants. A group of researchers in this area argues that participants can withdraw at any time from the course due to various personal reasons already mentioned above. On the other hand, it is said that it is difficult for a participant to give up almost at the end of the course, after so much work has been done. There must be a very strong motivation to take such decision.

CHAPTER 6.0. Conclusions and Recommendations

6.1. Conclusions

Even if we did not use systematic review approach, following the guidelines of this type of strategy contributed a lot to obtain useful information on data and factors affecting health professionals in CME.

From the analysis of the data on the triennium 2017/2019 FAD in Eduiss, it emerges that the dropout rate is very variable according to the type of course. As for the analysis of the three-year period, the highest number of dropouts is seen in courses with low interaction with free registration modality. While participants with the project registration mode show a slightly high percentage of retention. This is also noticed in the types of accreditation (CME and Non-CME) scheme. The non-CME has higher dropouts (39.9%) although the percentage difference is very marginal of those of CME (38.2%).

In the retrospective analysis on vaccines course, the evidence shows a wide variation of dropouts in gender and age. Female participants have a low retention rate compared to men ($p < 0.05$). While in age the younger participants were the ones who dropped out the most. According to the probability data, each year increase in age, the greater the probability of staying in the course. The types of employment do not show a statistically significant difference.

6.2. Recommendations

From the literature review, It would be recommended to encourage the authors to clearly report the dropout data, in order to allow analysis in a broader way in studies of different type. In addition, it would valuable the report of possible reasons of the phenomenon. According to the data presented here, further studies in a stratified form, would be required. To better understand the true underlying causes of dropouts. The matrix may be a useful tool to design an intervention. Given that it helps to clearly see where participants dropped out the most.

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7. 1. Appendices

Data extraction and assessment templates

Data Extraction and Assessment Template (1)	
Bibliographic Reference	Margolis et al. 2015: Online Continuing Medical Education for the Latin American Nephrology Community, MEDINFO, doi:10.3233/978-1-61499-564-7-372.
Data extractor	Nordino Ibraimo
Study Characteristics	
Type of study	Descriptive
Aim of the study	Describe the design, implementation and results of a multi-country bi-lingual CME program for Latin American nephrologists.
country of the study	Latin America
Type of intervention	<p>The course was implemented in the months of September and October 2013. The topic, Immunology in native and transplanted kidneys, focused on diagnosis, categorization and therapy for these conditions, currently undergoing major discoveries. EviMed provided a multidisciplinary team of communication and educational experts, clinicians, system engineers, medical information specialists and translators to design and implement the course, together with regional and international domain experts provided by SLANH and STALYC. There were 33 lecturers, including 25 from Latin America (20 clinical nephrologists and five immunologists), as well as six European and two North American experts. Including the tutoring roles, 59 domain experts participated in the design and implementation of this course. A multifaceted approach was used, in order to maximize opportunities for physician and health care professional participation and ensure that participants could interact and reflect on the material. Accordingly, the activities began with <u>an on-site and online synchronous launching event, followed by a distance education seven-week online modality with multiple educational strategies, and ended with a closing lecture. Reading resources, videos and voice-over presentations were published, together with pre- and posttests, patient aids, and electronic rounds (e-rounds) on clinical cases. Additionally, a clinical simulation using a custom tool developed with the School of Engineering, Universidad de la República, Uruguay, was used to provide applied learning through knowledge discovery and automatic feedback.</u> It was implemented in module 6, almost the end of the course, and it had multiple possible pathways, some better than others, not only right or wrong paths, as in real settings. The e-rounds were asynchronous discussion groups in either Spanish or Portuguese, coordinated by experts and tutors. This modality allowed physicians to participate whenever they could and wished to, lacking a fixed schedule to access the around. A total of <u>30 hours</u> of study workload along two months was estimated, in order to complete the course. Course evaluation, participation, satisfaction and knowledge gain were quantified through pre- and post-tests.</p>
Participants/population	The target population was 498 Spanish- and Portuguese-speaking nephrologists and other physicians caring for these patients working across the Latin American region. 59 experts and tutors and 55 observers (total=612 participants). Regarding the characteristics of the audience, 49% were women and 51% men. Eighty-five percent were nephrologists and 11% were nephrology residents, while the rest were internists, pediatricians, or pathologists, among other. Seventy-seven percent were 34 years or older.
Study results	Four hundred and ninety-eight physicians coming from 18 countries registered for the course; 442 of them participated in it. Of those who participated, 51% received a certificate of completion and 29% a certificate of participation. Sixty-five percent of registrants participated in

	the case discussions. Eighty-six percent were very satisfied and 13% were satisfied. Lack of time to devote to the course was the main limitation expressed (62%), while Internet access or difficulties in the use of technology were considered by only 12 and 6% of participants, respectively. There was a significant increase in knowledge between before and after the course; the average grade increased from 64 to 83%.
Strengths and limitations	Strengths: It has a very strong sample size Limitations: Not clear
Comments/notes	498 participants registered Only 442 started the course (56 earlier leavers). Dropout stated on the paper=11% Persistence stated=51%. Recalculation Dropout= 88 + 56= 144 Dropout Rate= 28,9% Completion Rate=71%
Potential conflict of interest from funding(y/N/unclear)	Unclear

Data Extraction and Assessment Template (2)	
Bibliographic Reference	Cabral et al_ TELEMEDICINE_2017: Distance Learning Course for Healthcare Professionals: Continuing Education in Tuberculosis, DOI: 10.1089/tmj.2017.0033.
Data extractor	Nordino Ibraimo
Study Characteristics	
Type of study	An Interventional Study
Aim of the study	A quasi-experimental before and after study to evaluate the DL community at the participant's learning level. In addition, to evaluate the DL community at the level of participant satisfaction, a cross sectional study was carried out after the course.
country of the study	Brazil
Type of intervention	<p>The pedagogical model used was structured as follows¹⁹:</p> <p>Organizational aspects. The objectives of this program are to update the participants about the main concepts in TB and to guide health care professionals about the clinical practice on TB care. The course was conducted in four modules of about 30min each, including a pretest to evaluate the participant's current knowledge and a post-test with repetition of the pretest questions to find out what users learned from the module. Participants could take the course at any time; however, there was a period of 4 weeks to complete the course. The course coordinator was available by email to clear up any doubt regarding the course. A certificate was provided for each participant upon completion of the course (the test results were not considered in completion, it was a participation certificate).</p> <p>Content. The content was addressed in different modules: (1) Module 1: TB Concepts and Epidemiology; (2) Module 2: Development of TB; (3) Module 3: Detection of TB cases; and (4) Module 4: TB Transmission and Biosafety Basics.</p> <p>Methodological aspects. Lessons were in the form of written text on slide show presentation. Participants' satisfaction and learning were assessed according to Kirkpatrick's training program evaluation model.¹⁷ To evaluate the DL community at participants' level of satisfaction; a questionnaire was carried out after the course. It was an electronic structured questionnaire with a Likert-type scale (totally dissatisfied, dissatisfied, satisfied, and totally satisfied), adapted from Giarola et al.,²⁰ including questions about course design, methodology, content, assessments, interaction with course coordination, and use of</p>

	<p>DL method. To evaluate the DL community at the participants' level of learning, a quasi-experimental before and after study was carried out, with pre and post-tests in each module. The tests were distributed as follows: Module 1 (four questions), Module 2 (four questions), Module 3 (four questions), and Module 4 (three questions). A score for the pretest and a score for the post-test were calculated, which varied from 0 to 15.</p> <p>Technological aspects. The DL course was developed within a virtual learning environment (VLE), that is, computer systems available on the Internet, intended to support activities mediated by information and communication technologies that allow integration of multiple mediums, languages, and resources to present information in an organized way, to develop interactions between people and objects of knowledge, and to elaborate and socialize productions to achieve certain objectives.²¹ The VLE used was Moodle. Moodle is the acronym for Modular Object-Oriented Dynamic Learning Environment, a free learning-support software.</p>
Participants/population	About 99 Nurses, involved in active inpatient or outpatient care of patients in the city of Porto Alegre and its metropolitan area that encompasses 31 municipalities (3,717,430 inhabitants) were recruited to participate in the study.
Study results	During the study period, 99 nurses who met the inclusion criteria were invited and accepted to participate in the study. However, only 66 started and completed the course and they were included in the analysis. The overall mean pretest and post-test scores were 10.3–2.2 and 11.4–2.7, respectively. Wilcoxon's test showed that learners increased their knowledge to a statistically significant degree ($p < 0.0001$). Table 1 shows the distribution of frequency of correct answers in pretest and post-test. At baseline, participants demonstrated an overall good knowledge in many topics covered by the DL course.
Strengths and limitations	Strengths: Limitations: The sample size is small to generate the findings to other settings.
Comments/notes	The dropout and persistence rates were not very well stated, but the way the data was displayed was easy to do calculations. Sample size=99 nurses Started= only 66 33 did not start (early dropout/leavers). Dropout rate= 33% Persistence rate= <u>66.6%</u> . The course design, objectives and participants characteristics, are quite similar to those of ISS, which make it comparable and useful for the info we are looking for.
Potential conflict of interest from funding (y/N/unclear)	No conflict of interest.

Data Extraction and Assessment Template (3)	
Bibliographic Reference	Colaceci et al. (2017): E-learning to Improve Healthcare Professionals' Attitudes and Practices on Breastfeeding, BREASTFEEDING MEDICINE Volume 12, Number 10, Mary Ann Liebert, Inc. DOI: 10.1089/bfm.2017.0060
Data extractor	Nordino Ibraimo
Study Characteristics	
Type of study	Observational study
Aim of the study	Assess the effectiveness of the e-learning program in improving attitudes and self-declared practices of healthcare professionals.

country of the study	Italy
Type of intervention	E-learning to Improve healthcare professional's attitudes and practices on breastfeeding The course was developed by two experts with a panel of reviewers from different backgrounds (midwifery, pediatrics, pediatric nursing, and toxicology). The learning objectives, the contents, and learning activities were geared to a basic level of updated knowledge on breastfeeding and human lactation. The course was structured according to the learning objectives in two updated e-books, including four mandatory case studies and four optional learning activities, provided to the participants to apply the concepts reported in the study materials. The knowledge post-test composed of 30 multiple-choice questions (10 from a knowledge test and 20 from the case studies), each of which had only 1 correct answer among the 5 options.
Participants/population	The cohort included in the study comprised all healthcare professionals who had: (1) completed the course, (2) passed the knowledge post-test, (3) filled out the satisfaction questionnaire, and (4) answered the questions on attitudes and practices (APs) at T0 and T1. The study excluded nonhealthcare professionals and healthcare professionals who did not meet the CME criteria or did not fill in the AP or the satisfaction questionnaire at T1. Applying these criteria, the cohort comprised 15,004 participants.
Study results	26009 health professionals completed the mandatory AP pre-test 1517 dropouts 24492 filled the CME evaluation 735 did not pass CME evaluation tools 23757 eligible for AP optional questionnaire 8753 did not fill the AP post-test 15004 completed the AP post-test. The course had 26,009 registrants from 28 different professions. Was successfully completed by 91.3% of users. The dropout rate was 8.7%. The final cohort was composed of 15,004 participants. The course improved attitudes, while minor changes were observed on practices ($p < 0.05$). Mean total attitude scores were 2.4 at T0 and 1.9 at T1, while mean total practice scores were 2.2 and 2.1, respectively. The main effects regarded the use of medications during breastfeeding (3.02–1.29 at T0 and 1.88–1.08 at T1) and the self-reported compliance with the International Code of Marketing of Breast Milk Substitutes (2.29–1.24 at T0, 2.03–1.21 at T1).
Strengths and limitations	Strengths: large sample size, high retention and completion rates, "low dropout rate". Limitations: Lack of control group and a selection bias. CME standard procedures require that knowledge scores only be measured in the posttest and for this reason, we could not estimate the degree of improvement between pretraining and post-training. The health professionals' performance and the health outcomes were not measured, as this was out of the scope of the course.
Comments/notes	The course focused in CME for non-traditional adult learners with the same characteristics (professional and demographic) of those from eduisse courses. The goal is the same as well. Doing meticulous calculations of dropouts, I found that the number is higher than argued in the article. 26009 assigned into course. 1517 inactives (early dropout/leavers) 8753 abandons/lurkers 10270 totals of dropouts (Absolute number) Dropout rate stated= 8.7% Completion rate stated=91.3% Recalculation Dropout Rate=39.4%, Completion Rate=60.6% 10 participants missing but not reported there%

Potential conflict of interest from funding(y/N/unclear)	N
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Data Extraction and Assessment Template (4)	
Bibliographic Reference	Oliveira AC, Mattos S, Coimbra M. Development and Assessment of an E-learning Course on Pediatric Cardiology Basics. <i>JMIR Med Educ.</i> 2017;3(1): e10. Published 2017 May 10. doi:10.2196/mededu.5434
Data extractor	Nordino Ibraimo
Study Characteristics	
Type of study	Descriptive vs inferential
Aim of the study	The study aimed to develop an e-learning pediatric cardiology basics course and evaluate its pedagogical impact and user satisfaction.
country of the study	Brazil
Type of intervention	<p>Development and Assessment of an E-learning Course on Pediatric Cardiology Basics (CME). The course was implemented on Moodle, hosted on the server at the Faculty of Medicine of the University of Porto, Portugal. The course was structured into 3 modules, with a total of 8 chapters. The content was presented using text, images, and videos. Diagnostic images and videos were collected directly from the Rede de Cardiologia Pediátrica (RCP) network at the Real Hospital Português in Recife, Brazil. The course was developed using Moodle (Modular Object Oriented Dynamic Learning Environment; Moodle Pty Ltd, Perth, Australia) and contents adapted from a book on this topic. To access it, the learners should register on the Moodle website according to their personal information. The course was created and revised between April 2014 and July 2014. Participants were contacted in September 2014, and those who registered to do the course first did the pretest and then had access to the asynchronous course, which was given until November 2014.</p> <p>It was built in a unidirectional way. First, the participants registered on the Moodle website. Then, a pretest of 16 questions was available during 20 min. After the answers submission, the first chapter was available. At the end of each chapter, a summary with the main key-points and a formative test of two multiple-choice questions for self-assessment was presented. These intermediate tests allowed immediate knowledge self-assessment. The next chapter would only be available if the user had given the correct answers. In case of error, the learner would be directed to a summary of the lecture, and then it was possible to go back to the previous lecture or repeat the assessment. At the end of these 8 chapters, a final summative assessment of 16 questions corresponding to the posttest was available during 20 min. After the final approval, a certificate was sent to the learners. Pedagogical impact evaluation used a pre and posttest approach using level 1 and 2 of Kirkpatrick model. User satisfaction was evaluated using Wang's questionnaire.</p>
Participants/population	The sample consisted of 62 health professionals, including doctors, nurses, and medical students, from 20 hospitals linked via a telemedicine network in Northeast Brazil.
Study results	<p>Contacted=80, Assigned=62 (13 dropped/inattivi), started course=49, completed=30 Dropout=19 (see table 1 below).</p> <p>Results revealed differences in knowledge assessment before and after the course ($Z=-4.788$; $P<.001$). Questionnaire results indicated high satisfaction values (Mean=87%; SD=12%; minimum=67%; maximum=100%). Course adherence was high (79%); however, the withdrawal exhibited a value of 39%, with the highest rate in the early chapters. Knowledge gain revealed significant differences according to the profession ($X^2=8.6$; $P=.01$) and specialty ($X^2=8.4$; $P=.04$). Time dedication to the course was significantly different between specialties ($X^2=8.2$; $P=.04$).</p>

Strengths and limitations	<p>Strengths: statistically significant results obtained in the used metrics of pedagogical impact, with quite interesting proportions of learning with just a few hours of training.</p> <p>Limitations: small sample size, some variables not normally distributed, used a non-validated translation to a Portuguese version of the user satisfaction questionnaire, risk of a slight bias because we did not control if learners resorted to external sources in order to provide correct answers to the tests.</p>
Comments/notes	<p>The study was chosen due to its approach into the structure and interactivity, that is similar to courses provided by eduiss.</p> <p>Sample Size: 62 Started the course: 49 Dropout stated: 39% Completion stated: 79%</p> <p><u>Recalculation</u> <u>Dropout rate=62.5%</u> <u>Completion rate=37.5%</u></p>
Potential conflict of interest from funding (y/N/unclear)	None declared

Data Extraction and Assessment Template (5)	
Bibliographic Reference	Gupta et al_Educational Innovation_2017: Disseminating Innovations in Teaching Value-Based Care Through an Online Learning Network, Journal of Graduate Medical Education.
Data extractor	Nordino Ibraimo
Study Characteristics	
Type of study	Observational??
Aim of the study	The study aims to develop and evaluate the acceptability, implementation, and feasibility of Teaching Value in Health Care Learning Network, to create a free platform to disseminate innovations that promote high-value care to educators and system leaders.
country of the study	United States of America
Type of intervention	<p>We launched the Teaching Value in Health Care Learning Network in March 2015. While open to the public, members were also recruited from North America through e-mail solicitation from professional societies affiliated with the American Board of Internal Medicine (ABIM) Foundation Choosing Wisely campaign and the Costs of Care list host, including innovators who participated in Teaching Value Choosing Wisely Challenges, co-sponsored by Costs of Care Inc and the ABIM Foundation. The network was also promoted on several social media networks such as Twitter and Facebook.</p> <p>The learning network has 3 components: (1) 20- to 30-minute interactive webinar discussion(s) with diverse on-the-ground and national leaders; (2) an online discussion forum to facilitate sharing ideas; and (3) an online repository for disseminating materials related to value innovations. The learning network employed a private Google Community, an online social network platform that offers collaborative communication and storage and utilized Google Hangouts. Google Hangouts on Air enables real-time YouTube broadcasting to a public audience from a "live" video chat session; it also enables remote learners to view an online panel of speakers in separate locations and post questions that can be moderated in real time. Sessions are automatically archived on YouTube, enabling asynchronous viewing.</p>
Participants/population	A total 277 practicing physicians and trainees in 7 specialties, nurses, educators, and health system leaders.
Study results	Six months after the program launched, there were 277 learning community members in 22 US states. Of the 74 active members, 50 (68%) completed the evaluation. Active members represented independently practicing physicians and trainees in 7

	specialties, nurses, educators, and health system leaders. Nearly all speakers reported that the learning network provided them with a unique opportunity to connect with a different audience and achieve greater recognition for their work. Of the members who were active in the learning network, most reported that strategies gleaned from the network were helpful, and some adopted or adapted these innovations at their home institutions. One year after the program launched, the learning network had grown to 364 total members.
Strengths and limitations	Strengths: Active delivery modality. Limitations: Small sample size, survey instrument lacks validity evidence, lack of data on actual impact of costs of care.
Comments/notes	The potential conflict of interest may have influence on the study outcome. Although from the available absolute numbers, was quite easy to calculate dropout rates and persistent on the course, which is our outcome of interest. Even if it does not fit very well on type of courses offered by ISS. Sample size=277 selected members Active= 74 Completed= 50= <u>68%</u> Dropout=24=32%
Potential conflict of interest from funding(y/N/unclear)	Potential Conflict of interest (yes)

Data Extraction and Assessment Template (6)	
Bibliographic Reference	Luz et al 2018: Characterization of the Reasons Why Brazilian Science Teachers Drop Out of Online Professional Development Courses, International Review of Research in Open and Distributed Learning, Volume 19, number 5.
Data extractor	Nordino Ibraimo Sulemane
Study Characteristics	
Type of study	Not clearly mentioned. (Descriptive, Observational) ??
Aim of the study	The procedure was aimed at trying to foster teachers participation and to identify possible reasons for dropping out of the courses.
country of the study	Brazil
Type of intervention	An online professional development program for science teachers comprising seven different non-degree courses was offered by CECIERJ throughout the three years of the present study (from 2010 to 2012). Courses are made available on Moodle free of charge and provided 30 hours of core work each. The courses were: Introductory Microbiology (MIC), Integrated Human Health (HHE), Introductory Botany (IBO), Understanding the Environment (ENV), Biodiversity (DIV), Sexuality and Education (SED), and Collaborative Technologies and Biology Education (TBE). Each pedagogical unit (course module) had the following components: lesson plans, main texts, additional texts, multimedia resources (animations, videos, simulators), and the distance activities (DAs). All courses comprised of: (i) discussion forums where members could take part in discussions about pedagogical issues and course contents and supervised by tutors; and (ii) assignments (all teachers received formative feedback from tutors). Each course comprised six DAs to be handed in according to a previously agreed schedule and a final paper to be submitted after the completion of the DAs.
Participants/population	The 19 online courses were offered by the state government and were aimed preferentially at teachers from public schools (Salvador, Crapez, Rolando, Rolando, & Magarão, 2010). The original sample to be analyzed in the present study comprised the 3,026 teachers who enrolled in at least one course during three consecutive years. Candidates filled online applications in which they should inform their educational background, teaching subjects, and professional affiliation. The applications always exceeded the number of spaces available. Criteria for admission were used and preference was given to qualified biology and science teachers working at public schools. All the applicants that fulfilled those two criteria were admitted. Demographic information, as well as data on teachers' use of internet tools, were obtained by means of an online questionnaire (Rolando, Salvador, & Luz, 2013). Briefly, the questionnaire consisted of closed-ended questions on whether or not each tool from a set of 13 different internet tools was used by each respondent. This analysis was based on a sample of 2,491 teachers (82% of the original sample) that provided demographic data and filled the questionnaires.
Study results	Only 17.7% of the teachers did not join their courses at any time while the remaining 82.3% handed in at least the first DA. A total of 1,543 teachers (46.9%) completed their courses by submitting the final paper resulting in a global dropout rate of 53.1%. Dropout rates ranged from 45% to 56% depending on the course.
Strengths and limitations	Strengths: it has a very strong sample size, which could easily validate the results. In addition, it provides similar characteristics of ISS, regarding the LMS, participants and subjects delivered.
Comments/notes	The way the study was conducted, is kind of the same pathway we intent to go through in the study of dropouts/persistence at ISS courses. It gives more insight on true factors affecting the retention rates in Online vs CME. Sample size= 3026 Completed=1543

	Dropout rate=53.1% Completion rate= <u>46.9%</u>
Potential conflict of interest from funding (y/N/unclear	Unclear

Data Extraction and Assessment Template (7)	
Bibliographic Reference	Bawa, P: Retention in Online Courses: Exploring Issues and Solutions—A Literature Review, SAGE Open January-March 2016: 1–11 © The Author(s) 2016 DOI: 10.1177/2158244015621777 sgo.sagepub.com
Data extractor	Nordino Ibraimo Sulemane
Study Characteristics	
Type of study	Literature Review
Aim of the study	This article reviews literature to ascertain critical reasons for high attrition rates in online classes, as well as explore solutions to boost retention rates. This will help create a starting point and foundation for a more, in-depth research and analysis of retention issues in online courses. Examining these issues is critical to contemporary learning environments.
country of the study	Global level
Type of intervention	A synthesis of literature information pertaining to retention issues and solutions for online environments must begin with a discussion of the theoretical concepts that determine the contexts within which online learning environments and learners are placed. There are several sociological theories, which explain learner behaviors in an online context. These, in turn, can become predictors and precursors of issues and solutions pertaining to online environments.
Participants/population	Learners within online environments (Graduates and CPDs).
Study results	The article provided a synthesis of literature to analyze online learning environments and learners with the intention of highlighting retention issues and recommending solutions. The high attrition rate in online courses is a cause for concern (Herbert, 2006; Heyman, 2010; B. Smith, 2010). This phenomenon needs to be studied in light of the growing demand for online programs in academic and corporate settings, and the fact that a fall in attrition rates will benefit students, institutions, and businesses (Allen & Seaman, 2011; Overton, 2007; Stanford-Bowers, 2008). Several studies have been conducted specifically to observe when and why students withdraw from graduate programs (Jaggars, 2011; Levy, 2007; Perry et al., 2008; Willging & Johnson, 2009). The results of these indicate that students were more apt to drop out during earlier stages of the semester, and there are multiple reasons for doing this including personal preferences, profession-related, and program-related issues. Family commitment and social obligations of students could be contributing factors in low retention. In addition, students without the norm value orientations may be unable to interact socially with their peers. As a result, such students felt incompatible with the institution's social system and were more likely to drop out (Evans, 2009; Rovai, 2003; Summers, 2003; Tinto, 2006-2007). The constructivist and self-oriented nature of online learning can create issues of motivation, particularly for learners with technological skill limitations. The assumptions of online course designers and educators about the technological compatibility of the digital native learners can lead to issues with course designs. These factors have been known to accelerate attrition rates
Strengths and limitations	Strengths: Interesting frameworks and findings Limitations: not clear about how the study was conducted. It does not follow a clear structure. Moreover, no quantitative data only qualitative.
Comments/notes	Despite that focus in online education in general, it comes up with interesting factors and respective probable solutions.
Potential conflict of interest from funding (y/N/unclear)	No

Data Extraction and Assessment Template (8)	
Bibliographic Reference	Muljana, P. S., & Luo, T. (2019). Factors contributing to student retention in online learning and recommended strategies for improvement: A systematic literature review. <i>Journal of Information Technology Education: Research</i> , 18, 19-57. doi:10.28945/4182
Data extractor	Nordino I Sulemane
Study Characteristics	
Type of study	Systematic Literature Review
Aim of the study	Investigates the underlying factors that influence the gap between the popularity of online learning and its completion rate. The review scope within this paper includes an observation of possible causal aspects within the non-ideal completion rates in online learning environments and an identification of recommended strategies to increase retention rates.
country of the study	United States of America
Type of intervention	Relevant studies were retrieved through a series of search efforts. Eligible research that meets the selection criteria were then identified. The search was carried out in two stages. First, an initial search was performed in the major databases such as Education Research Complete (n = 11), ProQuest (n = 35), ERIC (n = 8), JSTOR (n = 24), and Psych-Info (n = 15). Keyword searches were conducted using the combinations of "retention," "attrition," "online learning," "online courses," "online strategies," and "higher education." This first searching phase yielded 93 articles. Second, a further round of search was conducted on Google Scholar to expand the existing pool. Using the same combination of keywords, the search result gained approximately 700 articles in total. However, we identified 71 peer review articles from this second phase of searching. After removing 10 duplicates from the pool of these both rounds, the number of articles expanded to 154 articles in total. During the analysis phase, we identified additional literature by using reference lists and included those that meet the selection criteria. From this action, 11 articles were selected and added to the existing pool. Hence, we were ready to proceed to the synthesis phase, 40 articles published in 2010-2018 were included.
Participants/population	A systematic literature review was conducted on 40 studies published between 2010 and 2018. We established a set of criteria to guide the selection of eligible articles including topic relevance (aligned with the research questions), empirical studies, and publication time frame. Further steps were performed through a major database searching, abstract screening, full-text analysis, and synthesis process.
Study results	Revealed factors include institutional support, the level difficulty of the programs, promotion of a sense of belonging, facilitation of learning, course design, student behavioral characteristics, and demographic variables along with other personal variables. The recommended strategies identified for improving student retention are early interventions, at-all-times supports for students, effective communication, support for faculty teaching online classes, high-quality instructional feedback and strategies, guidance to foster positive behavioral characteristics, and collaboration among stakeholders to support online students.
Strengths and limitations	Strengths: It brings up great findings and relevant conceptual framework. Which can be used or adapted in other settings (CME) rather than online in higher education.
Comments/notes	Despite that focus in retention in a broad way, it was considered to this extraction due to its major contribution and the actual timeframe.
Potential conflict of interest from funding (y/N/unclear)	Unclear

Data Extraction and Assessment Template (9)	
Bibliographic Reference	Park, J.-H., & Choi, H. J. (2009). Factors Influencing Adult Learners' Decision to Drop Out or Persist in Online Learning. <i>Educational Technology & Society</i> , 12 (4), 207-217.
Data extractor	Nordino I Sulemane
Study Characteristics	
Type of study	Quantitative (descriptive statistics, chi-square, and multivariate analysis of variance (MANOVA).
Aim of the study	This study aimed to determine whether or not there were differences between dropouts and persistent learners in online courses in their individual characteristics, the perceptions of family support and organizational support, and the level of motivation (i.e., satisfaction and relevance). This study also intended to find factors to predict dropouts and persistent learners in online courses to help stakeholders associated with online courses for adult learners find ways to lower the high dropout rates.
country of the study	United States of America
Type of intervention	Particularly, this study focused on the three main categories: individual characteristics, external factors, and internal factors. To be more specific, age, gender, educational background, and employment status were chosen as individual characteristics because these four are the most often cited factors in previous studies (Park, 2007). External factors consist of family support and organizational support. Most adult learners have many responsibilities for their family as well as for their job, and their two are key factors affecting adult learners' decision to drop out of online courses (Park, 2007). Motivation is one of the most frequently studied variables in relation to dropout (Chyung, 2001; Chyung, Winiecki, & Fenner, 1998; Doo & Kim, 2000; Jun, 2005; Levy, 2007; Menager-Beeley, 2004). In particular, relevance and satisfaction are the sub-dimensions of motivation that have frequently been studied (Chyung et al., 1998; Doo & Kim, 2000; Levy, 2003, 2007; Shea, Pickett, & Pelz, 2003) and are known to be highly correlated with various course-related issues such as instructional design, organization of the online courses, instructors' facilitation, and interaction (Shea et al., 2003). This study could not include other internal factors such as social integration, academic integration, and technology issues shown in the above framework because the courses investigated in this study were developed before conducting this study, and the researchers did not have access to the course contents and were not involved with the design and development process.
Participants/population	The target population of this study was non-traditional adult learners who enroll in job-related online courses offered by a large Midwestern university. Since November 2002, 18 distance courses were offered, with 378 learners registering and 204 learners completing (dropout rate = 46.0%). Since 2005, when the current learning system was established, three online courses were offered three times, and 107 out of 234 participants completed the courses (dropout rate = 54.2%). The increasing dropout rate has become a concern to the program providers as well as to many other distance programs and institutions. The sample for this study was 147 adult learners who have either completed or dropped out of one of the three online courses offered between fall 2005 and summer 2007 and who agreed to participate in this study. Of the 147 participants, 98 (66.7%) were persistent learners while 49 (33.3%) were dropouts; 105 (71.4%) were female while 42 (28.6%) were male. About half of the

	participants were between 30 and 39 years old (73 participants, 49.7%) and had some college education (79 participants, 53.7%).
Study results	The results imply that lower dropout rates can be achieved if online program developers or instructors find ways to enhance the relevance of the course. It also implies that adult learners need to be supported by their organizations in order for them to finish online courses that they register for.
Strengths and limitations	Limitations: The sample of this study was selected from only one institution in the U.S. Thus, the results from this study may not be generalizable to adult learners in other institutions and/or countries. Further investigation is needed to confirm the generalizability of the results to broader populations. This study includes a limited number of variables even though they were chosen for their importance based on thorough review of the literature.
Comments/notes	Is in line on what we are looking for: Comparison of Dropouts and completers characteristics and main factors influencing dropout/retention for adults' non-traditional learners in online environment.
Potential conflict of interest from funding (y/N/unclear)	No

Data Extraction and Assessment Template (10)	
Bibliographic Reference	Jun, Ju Sung (2004). "Understanding the Factors of Adult Learners Dropping Out of E-learning Courses," Adult Education Research Conference. http://newprairiepress.org/aerc/2004/papers/44
Data extractor	Nordino I Sulemane
Study Characteristics	
Type of study	Observational
Aim of the study	The purpose of this study, is to determine the specific set of variables that can best predict the reasons that adults dropout of workplace e-learning courses.
country of the study	Korea
Type of intervention	The survey consisted of 15 Likert-scale items to measure learner's motivation on the work-related e-learning course and 10 internal, or ratio items. The response format on the Likert scale ranged from 1 (strongly disagree) and to 5 (strongly agree). The creation of 15 Likert-scale items was based on Keller's (1987) ARCS model. Based on the judgment of a scale development panel that consisted of adult educators and statistical experts, out of four subscales of motivation (ARCS) on the e-learning course, only the three scales of attention, relevance, and confidence were used for the study because the three subscales already reflect the satisfaction motivation itself. An exploratory factor analysis of the participants' responses to the 15 Likert-scale items on the survey was conducted using a principal component analysis method extraction with Varimax rotation. Factors with eigenvalues greater than 1.0 were extracted. After inspection of the rotated factor matrices, the three-factor solution (attention, relevance, and confidence consisting of 4, 5, and 6 items respectively) was selected as the most conceptually meaningful representation of the data, accounting for 64.34% of the variance. The variances explained by the three factors were 20.71, 23.99, and 19.64 percent respectively. The Cronbach alpha coefficient was calculated separately for each subscale (.85, .89, and .84 respectively).
Participants/population	The sample of 149 adult learners was drawn from employees enrolled at three e-learning institutions in Korea during February 2004. Based on the enrollment in the nine work-related e-learning courses in the three e-learning providers included in the study, the 149 learner

	participants represented a participation rate of 45%. Respondents were mailed a copy of the survey via e-mail.
Study results	<p>A Proposed Logistic Regression Model In order to test the significance of a proposed logistic regression model, the researcher used overall fit statistics of model-chi-square test (Log-likelihood test of a model), Hosmer and Lemeshow's Goodness of Fit Index, Nagelkerke's R-Square, and percentages correctly classified. The statistics of model-chi-square test ($\chi^2 = 77.291$, $df = 13$, and $p < .000$) and Hosmer and Lemeshow's Goodness of Fit Index ($\chi^2 = 6.196$, $df = 8$, and $p = .625$) reveal that the proposed model fits well. The statistics of percentages correctly classified (See Table 2) show that the proposed model correctly classified 91.3% of the completer and 70.5% of the dropout, for an overall accuracy rate of 85.0%. Nagelkerke's R-Square (.580) is also high. In order to determine which factors are relatively strong among all the predictor variables that influence the dropout of adult learners in an e-learning course, the researcher analyzed the statistics of Logit coefficients and Wald's test statistics for the significance of individual regressors. Based on the Logit coefficients and Wald's test, the researcher removed the four predictors of number of e-learning courses completed, age, gender, and educational level that are not relatively strong out of the list of predictors from the proposed model. The findings from this study suggest that the dropout of adult learners in e-learning is associated with motivational factors as well as individual characteristics or individual work environment. Confidence, one of e-learning motivation factors included in the model, is the most substantial factor to predict the dropout of adult learners in work-related e-learning courses. Those who have relatively higher scores on the confidence scale are more likely to complete the e-learning course. In light of marital status and hours worked per week, those who are married and have less hours of duty are more likely to complete courses. Although relevance, attention, number of learning hours for the course, and mandatory/voluntary attendance within the predictor set are not significant predictors, these variables make a contribution in a certain degree to a useful logistic regression equation for the study.</p>
Strengths and limitations	Good sample size.
Comments/notes	It focuses in CPD at working place. The Model used can be adapted into ISS context.
Potential conflict of interest from funding (y/N/unclear)	Unclear