Journal of Community Medicine & Health Education

Richardson et al., J Community Med Health Educ
2018, 8:6
DOI: 10.4172/2161-0711.1000638

Research Article Open Access

Predictive Factors for Approval and Knowledge Gain of a Massive Open Online Course (MOOC) On Type 2 Diabetes Mellitus in the First Level of Care

Richardson VL[1], Magallanes CR[2], Hernández DL[1], Martínez IV[3], Ixta ZL[3], Villalba PR[3], Salinas CA[4], Díaz IS[1], Mejía Arias MA[4] and Magana-Valladares L[5*]

[1]*The College of Morelos, Institute of Security and Social Services of State Worker, Mexico City, Mexico*

[2]*Autonomous Metropolitan University, Mexico*

[3]*National Institute of Public Health, Mexico*

[4]*Department of Endocrinology, National Institute of Medical Sciences and Nutrition "Salvador Zubirán", Mexico*

[5]*Association of Schools and Programs of Public Health, Washington, USA*

[*]**Corresponding author:** Laura Magaña-Valladares, PhD, President and CEO, Association of Schools and Programs of Public Health, 1900 M Street NW, Suite 710, Washington DC, USA, Tel: 202-296-1099; Ext-120; E-mail: lmagana@aspph.org

Receive date: November 20, 2018; **Accepted date:** November 28, 2018; **Published date:** November 30, 2018

Abstract

Aim: Massive and Open Online Courses (MOOCs) emerge as attractive platforms to train, on a large scale and at low cost, the health personnel of the First Level of Care, in the detection and updated management of patients with Type 2 Diabetes Mellitus.

Objective: To analyze possible predictive factors to conclude, approve and take advantage of a MOOC on Type 2 Diabetes Mellitus among the members of the multidisciplinary health team in the First Level of Care.

Methods: A before-after study was conducted on MOOC with national representation. The analyzed variables were: age, sex, level of studies, professional profile, type of hiring, initial and final exam grades, and measure of achievement.

Result: Of the total of 4361 participants, 3625 completed the course (83.2%). Of these, 2369 participants (66%) approved with a rating higher than 65%. Graduate academic levels had the highest approval rates (70.9%). By professional profile, the lowest percentage of attrition was in the Nutrition group. The highest approval rate was obtained by the profiles of Psychology, Nutrition and Medicine, as well as the participants with initial grades higher than 51%. The predictive factors for the approval of the course were: academic level, professional profile and grades in the initial diagnostic examination.

Conclusion: MOOCs can be incorporated among Public Health strategies in the First Level of Care as a very useful training tool on Type 2 Diabetes Mellitus, to increase the knowledge and skills of multidisciplinary health personnel. There are predictive factors for the approval of this course, which can be taken into account in the planning of future courses.

Keywords: Primary health care; Online education; Diabetes mellitus-type 2

Introduction

Type 2 Diabetes Mellitus (T2DM) is a high-priority public health problem at a global level, which requires a concerted effort to improve the preventive services of Primary Health Care (PHC) [1]. Treatment of T2DM requires a health determinants approach and comprehensive medical care with the involvement of a multidisciplinary team to follow up on the needs that arise as the disease and its associated complications develop [1-5]. This team needs up-to-date and continuing education in a variety of medical and preventive approaches to ensure patients are empowered, that they participate in their own treatment and acquire competencies that promote greater glycemic control. In Mexico, the Institute of Security and Social Services for State Workers (ISSSTE in Spanish) uses a model for comprehensive management of diabetes in stages (MIDE, Spanish acronym for the model). This model takes into account the patients' education in the development of prevention strategies [1-3]. The model integrates a multidisciplinary team to increase the scope of PHC preventive services and, thus, impede the disease's intensification and prevent the development of complications in patients [6,7]. The model is based on three pillars: patient empowerment, training of health care personnel and the strengthening of the health system infrastructure [3,6,7]. Within this context, there is a need to seek new high-scope educational platforms that enable effective training of health personnel treating and caring for patients with chronic illness.

Massive Open Online Courses (MOOCs) have emerged as an attractive low cost platform for large-scale training of health care personnel in the prevention and quality care based on new educational strategies [7-10]. In this way, MOOCs are a promising strategy to improve the health education of patients, as well as the timely

detection and updated management in T2DM. Due to its nature and implementation, it is convenient to know some of the factors that can influence on the completion rates of this strategy, as well as its effectiveness in the transmission of knowledge and competencies among the health personnel [11-17].

The objective of this study is to analyze the predictive factors associated with the completion, achievement and knowledge gain of a MOOC in the acquisition of knowledge for the diagnosis and treatment of T2DM, among the various members of the primary health-care level team.

Methods

Study design

A before-after study, without a control group, was conducted on a MOOC for the health personnel. The course was given between the months of September and December 2015.

Study population and recruitment

The study included a population comprising both sexes from the 35 ISSSTE delegations of the 32 federal entities of Mexico. Thus, the sample has a national level. The participants, health care personnel involved in the integrated management of T2DM patients within PHC (medical personnel, nursing, nutrition, psychology, physical therapy, dentistry and social work) were recruited using a closed call by direct invitation.

Educational strategy-online course

The programmatic objective of the course was aimed at reinforcing the knowledge and competencies required to increase the effectiveness of the interventions that make up T2DM early detection and treatment. The course was composed of three modules; module 1: "Quality Care of T2DM and its Comorbidities"; module 2: "Detection of Cases at Risk of Diabetes and Implementation of Preventive Measures"; module 3: "Adherence to Treatment and Long-term Care". The entire course lasted approximately 45 hours, with 6 weeks as the estimated average time needed for its completion. Each module integrated fact sheets and case studies supported by scientific evidence and videos of experts in the different topics addressed. Materials were accessed through hyperlinks.

Programmed competences and assessment model

The competencies addressed in the course were: 1) incorporate elements that improve the quality of care in patients with T2DM and their comorbidities into clinical practice, 2) implement structured actions that allow scrutiny, detection of at-risk cases and prevention of T2DM with a cost-effective relation for PHC units and 3) implement guidelines or schemes that allow detecting the most common obstacles to therapy adherence, and their corresponding resolutions, through the empowerment of patients and their families. The modules were taught consecutively. Participants took a case-study-based exam at the end of each module. Each module required completion before the participant could continue on to the next. Participants who failed an exam were required to review the materials and retake the exam until attaining a minimum passing grade (higher than 65 points out of 100), without limiting their number of attempts.

Data collection instrument

A self-administered questionnaire was designed to measure knowledge gain and competencies in a range of topics related to the diagnosis, treatment and identification of T2DM patients at risk of complications. Two versions of the same questionnaire were prepared: One for the medical personnel and a second one, with a lesser extent and complexity, for personnel from other disciplines. Both versions were applied at the beginning and at the end of the course, changing only the order in which questions appeared. Data on socio-demographic variables were collected during the course registration of participants.

Study variables

The structured questionnaire allowed us to obtain participants' characteristics such as sex, age, place of affiliation, professional profile and type of employment. In addition, the pre-exam score, each module grade, and the post-exam score were recorded. The dependent variables (output) were: The final grade of the first attempt (passing) and knowledge gain. The gain of knowledge was defined as the arithmetic difference between the final exam score minus the diagnostic exam score. The independent variables included sex, age, professional profile, academic profile and type of employment.

Selection criteria: Inclusion/Exclusion

Of the registered participants, those who did not have complete information in any of the exams, or in which incomplete, inconsistent or non-existent variables were identified, either due to capture or programming errors, were excluded from the analysis.

Database and statistical analysis

All data were compiled in a database. Categorical variables were described as absolute frequency and percentage, with the corresponding 95% of Confidence Interval (CI). The 95%-CI for the categorical variables was obtained using a bootstrap sample of 1000 replications. Categorical variables were compared using an X^2 and Fisher's exact test, as applicable. Measures of central tendency and dispersion were calculated for the quantitative variables. The diagnostic and final exam grades and knowledge gain according to the professional profile of the participants were compared using an ANOVA single-factor analysis, and a mean comparison analysis based on Bonferroni's and Tamhane post-hoc contrasts of multiple comparisons in accordance with the results of the homogeneity of variances analysis, determined by Levene's test. The comparison of the participants' knowledge gain was calculated using a test for related samples. Multiple linear models were calculated to evaluate the relationship between passing and knowledge gain, using independent variables. Values of $p<0.05$ (two queues test) were considered significant.

Results

Baseline characteristics of the study population

A total of 4383 participants presented the initial diagnostic exam. From these, 22 files were excluded because they were not part of the multidisciplinary team. Of the total of 4361 analyzed cases, 3625 participants completed the course (83.12%), and 736 (16.8%) did not presented the final exam (dropouts). Of the 3625 participants who

completed all the exams and completed the course, 2396 passed with a final grade equal to or greater than 65%. This represents 54.94% of approval for the total number of participants who answered the initial exam and 66% approval among those who completed the course, as shown in Table 1. 69% of the participants were women, more than half of the participants (57%) had a bachelor's degree and 86% of the population was made up of doctors and nurses. Of the men who completed the course, 68.2% passed it, as well as 65.22% of the women. With regard to the academic level, the technical level had the highest percentage of dropouts (22%). The highest percentage of grades was obtained in the postgraduate levels (70.9%), and the lowest percentage in the technical and undergraduate levels (54.8%). The participants with a bachelor's degree obtained a 67.4%, placing themselves in the middle of the other professional levels. In turn, the professional group that had the lowest dropout percentage was nutrition, and the one with the highest dropout percentage was the social work professional group. The highest percentage of grades was obtained by participants with profiles in Psychology, Nutrition and Medicine. Of the total (n=3625) of participants who completed the course included in the analysis, 1066 (29%; CI-95% 27.9-30.7) were men and 2559 (70%, CI-95% 69.3-72.1) were women; a statistically significant difference (p-0.035).

Sex	Total	Percentage (%)	Drop-Outs	Percentage (%)	Completed	Percentage (%)	total	Participants who passed the exam	% with respect to those who completed	% regarding the total of students
Men	1335	30.61%	269	20.15%	1066	79.85%	-	727	68.10%	54.46%
Women	3026	69.39%	467	15.43%	2559	84.57%	-	1669	64.90%	55.16%
Total	4361	100%	736	16.88%	3625	83.12%	-	2396	66%	54.94%
Academic level										
Technical	705	16%	155	22%	550	78%	-	-	-	-
Junior High school	22	1%	4	18%	18	82%	624	342	54.80%	43.24%
High school	64	1%	8	12.50%	56	87.50%	-	-	-	-
Bachelor's degree	2472	57%	384	15.50%	2088	84.50%	2088	1407	67.40%	56.92%
Master's degree	306	7%	44	14.40%	262	85.60%	-			
Specialty	760	17%	136	17.90%	624	82.10%	913	647	70.90%	58.93%
Doctorate	32	19%	5	15.60%	27	84.40%	-	-	-	-
Total	4361	100%	736	16.88%	3625	83.12%	3625	2396	66%	54.94%
Professional profile										
Medicine	1962	45%	325	16.50%	1637	83.40%	-	1202	73.40%	61.26%
Nursing	1782	41%	314	17.62%	1468	82.40%	-	833	56.70%	46.75%
Nutrition	211	5%	26	12.30%	185	87.70%	-	142	76.80%	67.30%
Dentistry	169	4%	24	14.20%	145	85.80%	-	100	69%	59.17%
Social work	128	3%	30	23.40%	98	76.60%	-	58	59.20%	45.31%
Physical therapy	63	1%	10	15.90%	53	84.10%	-	30	56.6	47.62%
Psychology	46	1%	7	15.20%	39	84.80%	-	31	79.50%	67.39%
Total	4361	100%	736	16.88%	3625	83.12%	-	2396	66%	54.94%

Table 1: Distribution of the study population by sex, academic level and professional profile.

Course achievements

To identify if there are significant differences between the Diagnostic Exam (DE) and the Final Exam (FE), the t-test for paired data with a 95% CI was used. Table 2 shows that there were significantly 22.23/100 points of knowledge gain before and after taking the course ($p<0.05$).

	Diagnostic Exam					Final Exam				Knowledge gain		Approval			
	n	Mean	SD	CI 95%		Mean	SD	CI 95%		FE-DE	p1 value	Percentage (%)	CI 95%		p2 value
Medicine	1202	53.23	11.56	52.67	53.79	74.57	14.66	73.86	75.28	21.34	<0.05	73.40%	71.20%	75.50%	
Nursing	833	45.63	11.95	45.02	46.25	68.37	18.15	67.44	69.3	22.74	<0.05	56.70%	54.20%	59.30%	
Nutrition	142	53.14	12.6	51.31	54.96	74.72	14.43	72.63	76.81	21.58	< 0.05	76.80%	70.10%	82.30%	
Psychology	31	51.18	11.1	47.58	54.78	77.59	13.65	73.17	82.01	26.41	<0.05	79.50%	63.80%	89.50%	
Physical therapy	30	44.28	12.66	40.79	47.77	69.79	16.43	65.26	74.32	25.51	<0.05	56.60%	43.00%	69.30%	
Dentistry	100	46.43	11.96	44.46	48.39	72.78	16.18	70.12	75.44	26.35	<0.05	69.00%	61.00%	76.00%	
Social work	58	45.18	12.68	42.64	47.72	69.6	18.91	65.81	73.39	24.42	<0.05	59.20%	49.20%	68.50%	<0.05
Women	1669	48.82	12.32	48.34	49.3	71.47	16.87	70.82	72.13	22.65	<0.05	65.20%	63.40%	67.00%	
Men	727	51.16	12.49	50.41	51.91	72.66	15.94	71.71	73.63	21.51	<0.05	68.20%	65.30%	70.90%	0.08
16-30	262	50.2	12.64	48.98	51.43	71.82	16.62	70.21	73.43	21.62	<0.05	63.90%	59.10%	68.40%	
31-45	918	49.78	12.3	49.12	50.44	72.29	16.73	71.4	73.19	22.51	<0.05	68.20%	65.60%	70.60%	
46-60	917	49.13	12.59	48.47	49.79	71.62	16.32	70.77	72.47	22.49	< 0.05	64.80%	62.30%	67.30%	
61-80	142	49.33	12.25	47.68	50.97	71.66	17.35	69.32	73.99	22.33	<0.05	66.00%	59.40%	72.10%	0.22
Undergraduate	342	44.02	12.24	43.06	44.98	66.58	18.99	65.09	68.07	22.56	<0.05	54.80%	50.90%	58.70%	
Degree	1407	49.83	12.19	49.31	50.35	72.58	16.17	71.89	73.28	22.75	< 0.05	67.40%	65.30%	69.40%	
Postgraduate	647	52.52	11.84	51.75	53.29	73.67	15.09	72.69	74.66	21.15	<0.05	70.90%	67.80%	73.70%	<0.05
Line-level employees	1704	48.88	12.15	48.42	49.35	71.29	16.8	70.65	71.94	22.41	<0.05	65.10%	63.30%	66.90%	
Exempt employees	350	51.88	12.91	50.77	53.01	73.95	16.06	72.56	75.35	22.06	< 0.05	68.40%	64.20%	72.20%	
Contract employees	342	50.34	12.94	49.2	51.48	72.43	15.97	71.02	73.84	22.09	<0.05	68.80%	64.60%	72.70%	
National	3 625	49.51	12.42	12.06	12.75	71.74	16.6	71.18	72.29	22.23	<0.05	66.10%	64.60%	67.60%	0.14

Table 2: Comparison of the average values by exam type and output variable in the participants who completed the course.

Prediction analysis of course approval

Table 3 shows the statistically significant differences and the predictive value for the approval of the course among the different groups. The type of employment and age and did not show statistically significant differences between the different groups. Regarding the professional profile, the nursing staff had 2.79/100 points less than the physicians ($p=0$). There were no differences with statistical significance in the other professional profiles. Personnel with a bachelor's degree had significantly greater knowledge gain than undergraduate or technical personnel. Women had 1.6/100 more points of achievement compared to men.

	Non-standardized coefficients		Typified coefficients	T		95.0 % confidence interval for B	
Model	B	Standard error	Beta	Lower limit	p value	Upper limit	
Total population							

Gender							
Female	Ref.						
Male	-1.212	0.655	-0.033	-1.85	0.064	-2.496	0.071
Age	-0.016	0.029	-0.011	-0.56	0.576	-0.072	0.04
Professional profile							
Medicine	Ref.						
Nursing	-2.799	0.771	-0.081	-3.63	0	-4.311	-1.286
Nutrition	-0.429	1.333	-0.005	-0.32	0.748	-3.042	2.185
Psychology	3.51	2.743	0.02	1.28	0.201	-1.868	8.888
Physical therapy	-1.716	2.408	-0.012	-0.71	0.477	-6.437	3.007
Dentistry	1.209	1.448	0.014	0.83	0.404	-1.63	4.047
Social work	-1.396	1.742	-0.013	-0.8	0.423	-4.811	2.02
Employment							
Line-level employees							
Exempt employees	0.838	0.832	0.017	1.01	0.314	-0.793	2.468
Contract employees	0.655	0.878	0.013	0.75	0.456	-1.067	2.377
Academic level							
Undergraduate	Ref.						
Degree	1.632	0.836	0.048	1.95	0.051	-0.008	3.271
Postgraduate	1.728	0.979	0.044	1.77	0.078	-0.191	3.648
Diagnostic exam	-0.58	0.023	-0.426	-25.58	0	-0.625	-0.536

Table 3: Linear regression model to predict knowledge gain of the course by professional profile.

Knowledge gain by modules

Table 4 shows the knowledge gain associated with each of the MOOC modules. In general, it was observed that for all modules, there were failing grades in the baseline exam (less than 51%) and passing grades (greater than 65%) in the final exam. This situation reflects a significant increase in the level of knowledge (gain between 20 and 23 points). The starting point of module 3, related to empowerment strategies of the patient and his family to improve their therapeutic adherence, was the lowest in both categories. The medical profile showed a greater gain in patient empowerment strategies (mean of knowledge gain=22.98) in comparison with the other profiles; the latter obtained greater gains in the risk stratification of diabetic patients and cost-effectiveness of the early diagnosis of T2DM (average gain=23.59) compared to the other modules, although they were not statistically significant.

	Knowledge gain				
Module	**Mean**	**SD**	**CI 95%**		**p1 value**
Doctors n=1637					
Module 1	20.554	18.519	19.656	21.452	0
Module 2	20.507	19.158	19.578	21.435	0
Module 3	22.986	20.657	21.985	23.988	0
non-medical participants n=1988					

Module 1	21.96	26.377	20.8	23.121	0
Module 2	23.592	22.52	22.601	24.582	0
Module 3	22.718	21.582	21.769	23.668	0

Table 4: Results for each of the diagnostic and final exam modules, medical and non-medical participants.

Discussion

The present study evaluated the effectiveness of a MOOC in the acquisition of knowledge and competencies for the diagnosis and treatment of T2DM in the National Development Plan (PND in Spanish), which was addressed to health professionals that work at the ISSSTE. Since the course was originally offered to train medical and nursing staff, it is not surprising that most of the participants belong to these areas. Among the sociodemographic variables, it is important to emphasize that there was a greater response to the call by women (relationship 12:5). This greater proportion of women could be explained by a greater interest in participating in issues related to health. However, some differences in the conformation of the sample could be explained partly by the variations of gender according to cultural and historical contexts [18-20]. The vast majority of the nursing staff, at technical level, undergraduate and graduate was women. There was an inequality between the academic degrees of the participants: the vast majority of men had a postgraduate degree (specialties and masters), while in women the proportion was divided between technical levels (mainly in nursing) and the specialties. Another gender difference was the distribution of line-level and exempt employees. Exempt employee job positions seem to be reserved for workers with a degree or postgraduate studies, and contract employee positions for people with technical level. In the same way, we observed gender differences in relation to the professional profile of the multidisciplinary team; the vast majority of physical therapy personnel are made up by men, while the nursing, nutrition, dentistry, psychology and social work staff is made up by women. The course was mainly designed to strengthen the competencies of physicians and nurses, but there was a broad participation of other health professionals who make up the multidisciplinary team. This can be explained by the continuous diffusion of the MIDE program among the health personnel; one of the program's pillars is the training of personnel from other disciplines. This finding demonstrates the great interest of non-medical personnel in contact with the diabetic patient, to expand their knowledge and specific competencies in the complex management of this condition. This factor should be considered in the design of specific courses for the non-medical personnel of the different health institutions.

The terminal efficiency reported of the MOOCs created by the National Institute of Public Health (INSP in Spanish) is very varied. It depends on the difficulty, the profile to which it is addressed and its duration. In May 2017, the official MOOC platform of INSP was launched. Currently, there are a total of 14 registered MOOCs and the terminal efficiency average is 56.6% (October 31, 2018, INSP data). There is course in the INSP platform that is similar to the one reported here. This course, "Diabetes and other chronic diseases" reports a terminal efficiency of 26% (October 31, 2018, INSP data), which is way below the results presented in this research project, but very high compared to other results that have been previously reported in this type of courses that do not exceed 10% [21,22]. Unlike the reported international percentages about the low terminal efficiency of MOOCs, a large number of participants (83.12%) completed this course [12].This may be due to the fact that, although the course meets the characteristics of MOOCs (massive and free) [13], it was offered to participants who received reminders from the central command authorities of the ISSSTE, and the graphic and instructional designs were adequate for the course.

In relation to the evaluations, it was first noted that the result of the diagnostic exam indicates differences in the starting point of the participants of the different professional profiles. Workers with profiles such as psychology, nutrition and medicine presented a superior diagnostic exam grade than the rest of the professional profiles. However, a lower knowledge gain was observed in contrast to the rest of the profiles. In general, it was observed that as the diagnostic rating increases, the degree of affordable knowledge gain decreases. Nevertheless, this happened only for those participants with higher education, but not with those who have undergraduate studies. This association could be related to characteristics of the educational tool itself, because in order to interact with it, certain technological skills and knowledge are necessary to achieve the maximum benefit [19,21].

Similar studies that measure the efficacy of computerized educational interventions on T2DM in nursing personnel have also found positive knowledge gains. One of them, which consisted of a PowerPoint file loaded on an educational website with intranet connections, but without the possibility of interaction or feedback, registered gains of 1.53 points, which are much lower than those registered among the participating nurses in this study (22.74 points) [21,22]. Another study regarding an educational platform with the tools of this course, as well as a forum with public activities, the possibility to send and receive both private and public messages, and the possibility to view the content at any time, obtained a knowledge gain higher than the recorded in this study (25 points vs. 22.74 points) [22]. These evidences suggest that the greater the interactivity of the course, the greater the knowledge gain, at least for the nursing staff.

Regarding the contents of each module, significant differences were observed between the profiles: Physicians gained knowledge mainly from the patient empowerment module and the patient physician relationship. For the other profiles, the knowledge gain was better in the risk identification and treatment modules. This is relevant since the opportunity areas that must be integrated into the training courses of the multidisciplinary team for the integral management of the diabetic patient are identified.

The fact of not finding significant differences in the evaluations of the final exam between the various members of the multidisciplinary team, allows us to suggest that the course design provides appropriate tools for the T2DM diagnosis and treatment in the primary health care level of non-medical staff of the institution, and thus contributes to the objective of strengthening the training of the entire multidisciplinary health team. However, it is necessary to know the perception and assess the specific needs and competencies of the non-medical personnel that make up the multidisciplinary team, to structure special

courses that complement what they have learned from it, and to design other courses focused on the objectives that must be met by each health professional, without losing the multidisciplinary and holistic health approach required by the patients with T2DM.

A problem still pending is the critical evaluation of the effect of the knowledge gained in the day to day clinical practice. Questions that need to be addressed in another research study are: After the health providers took the course, did their patients achieve a better metabolic control? Did their patients develop less complication from T2DM? Did their patients develop a healthier lifestyle?

Limitations

Since the course was initially designed for a specific professional profile (doctors and nurses), it is difficult to make a detailed comparison between the different professional profiles. It is necessary and convenient to explore, throughout other researches, the impact of this strategy with variables that reflect the gains in health for patients, as well as the improvement of processes and therefore the quality of care. It is also necessary to carry out research on the determinants that influence the participants in order to explain the differences in the grade scores and knowledge gain rates by professional profile, as well as the preferences in the educational tools, and the impact of the use of different audiovisual materials.

This study provides evidence on the usefulness of incorporating MOOCs as a high-reach and low-cost public health strategy to train a large segment of the medical and non-medical personnel that are part of the multidisciplinary team in the comprehensive care of patients with T2DM in the primary health care level, and improve their knowledge on the subject.

The difference between the initial and final scores showed that the achievement and knowledge gain of those participants who passed the course were important. The percentage of completion of the course and its approval were much higher than figures previously reported with this type of courses. Altogether, participants with technical levels of education had more dropouts and lower approval percentages than the postgraduate and bachelor's degree participants. Both the academic level and the professional profile showed predictive values for completing the course. Postgraduate and undergraduate levels showed the highest probability, as well as the profiles of psychology, nutrition and medicine. Likewise, the initial diagnostic exam score is a constant predictive factor that can be used as a guide in order to foretell which participants are most likely to conclude a course with these characteristics, which could be useful information for course organizers as a selection tool.

Financing

The reported data are property of ISSSTE, Mexico. The translation was funded by the INSP.

References

1. López-Hernández D, Blanco-Cornejo M, Navarro-Meneses R (2016) Need for new models of primary health care in low and middle income countries. Pan Am J Public Health 39: 387-388.
2. Blanco-Cornejo M, Chiang-Sam IRP, Sánchez-Díaz I, Cerritos A, Meneses RN, et al. (2015) Empowerment: Approximation and implications in clinical practice, medical education and health and social security systems. Med Educ 16: 202-203.
3. Blanco-Cornejo M, Riva-Palacio IL, Sánchez-Díaz I, Cerritos A, Tena-Tamayo C, et al. (2017) New model for diabetes primary health care based on patient empowerment and the right to preventive health: The MIDE program. Rev Panam Salud Pública 41:e128.
4. Official Gazette of Federation (2014) Official Mexican standard nom-015-ssa2-2010, for the prevention, treatment and control of diabetes mellitus. NORMA Official Mexican NOM-015-SSA2-2010, For the prevention, treatment and control of diabetes mellitus.
5. Jiménez-Corona A, Aguilar-Salinas CA, Rojas-Martínez R, Hernández-Ávila M (2013) Diabetes mellitus type 2 and frequency of actions for its prevention and control. Public Health Mex 55: S137-S143.
6. Aguilar Salinas CA, Hernández Jiménez S, Hernández Ávila M, Hernández Ávila JE (2015) Actions to face diabetes. Position document. National Academy of Medicine of Mexico.
7. Masic I (2008) E-learning as new method of medical education. Acta Inform Med 16: 102-117.
8. Masic I, Pandza H, Kulasin I, Masic Z, Valjevac S (2009) Tele-education as method of medical education. Med Arh 63: 350-353.
9. Ruiz JG, Mintzer MJ, Leipzig RM (2006) The Impact of E-Learning in Medical. Educ Acad Med 81: 207-212.
10. Klonoff DC (2013) The current status of health for diabetes: Will it be the next big thing? J Diabetes Sci Technol 7: 749-758.
11. Reuell P (2013) Online learning: it's different. The Harvard Gazette.
12. Goldberg LR, Bell E, King C, O'Mara C, McInerney F, et al. (2015) Relationship between participants' level of education and engagement in their completion of the understanding dementia massive open online course approaches to teaching and learning. BMC Med Educ 1: 60.
13. Gisbert M, Oliver M, Sancho-Vinuesa T (2015) MOOCS in Catalonia: An instrument for innovation in higher education. Educ 18: 125-146.
14. Stone J (2016) Awarding college credit for MOOCs: The role of the american council on education. Educ Policy Anal Arch 24:1-16.
15. Hollands FM, Tirthali D (2014) MOOCs: Expectations and reality, full report for the center for benefit-cost studies of education. Bibsonomy.
16. Liyanagunawardena TR, Williams SA (2014) Massive open online courses on health and medicine: Review. J Med Internet Res 16: e191.
17. Volandes AE, Kennedy J, Davis AD, Gillick MR, Paasche-Orlow MK (2013) The new tools: What 21st century education can teach us. Healthcare 1: 79-81.
18. Hoy MB (2014) MOOCs 101: An introduction to massive open online courses. Med Reference services quarterly 33: 85-91.
19. García-Cruz AG, Hernández-Velázquez AD, Molotla-López MB, Saavedra-Vázquez J, Vargas-García V (2012) A look at the processes of professionalization and gender of civil society organizations. Global initiative for equity, justice and ecology, A.C. National Institute of Social Development.
20. Baratta A (2000) The gender paradigm, the traps of punitive power. Byblos.
21. Ahearn A (2017) The flip side of abysmal mooc completion rates? Discovering the most tenacious learners. Edsurge.
22. Observatorio de Innovación Educativa (2014) MOOC. Edu Trends. Tecnológico de Monterrey.