

# Online Public Health Education for Low and Middle-Income Countries: Factors Influencing Successful Student Outcomes

<http://dx.doi.org/10.3991/ijet.v6i4.1797>

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**Abstract—Background:** Affordable, online public health education could assist health and development in low and middle-income countries. The Peoples-uni ([www.Peoples-uni.org](http://www.Peoples-uni.org)) aims to provide this through a fully accredited, low cost, online Masters in Public Health. Although literature exists relating to online learners in general, we lack research regarding the characteristics of successful learners in this new student group. This study assessed which readily available information on learners could predict success in course modules.

**Methods:** A descriptive survey method was used to assess correlations between pass rates with students' personal characteristics (gender, nationality etc) and indicators of course engagement (discussion contributions, online profile etc). We sampled all students starting modules between September 2009 and March 2010 (n=218).

**Results:** All indicators of engagement correlated strongly with pass rates, particularly online presence (photo/personal information on profile). Paying for modules correlated with higher pass rates than not. Interestingly, waiving fees correlated with lower pass rates than those who had not paid. Personal characteristics were not related to pass rates.

**Conclusion:** Engagement is important for success, and indicators of which can predict pass rates, the personal characteristics investigated were not related to success. Further research is required to understand the nature of associations this study highlights.

**Index Terms—**Open and Distance Learning, Outcome indicators, Peoples-uni, Public Health education.

## I. INTRODUCTION

A dire shortage of public health capacity plagues many low- and middle-income countries (LMIC). Whilst the chronic shortage of health workers is often cited as the main barrier, the other critical issue is the lack of public health skills and knowledge in the existing workforce [1]. Central to developing this public health capacity is therefore the need for further education for health workers in these countries. However, for many health workers in these countries, there are numerous barriers that limit their ability to undertake continuing professional development. These include the direct and indirect costs of undertaking such education, time and access issues [2]. These make attending face-to-face courses virtually impossible. As such, the need to identify ways of enabling these health workers to access further education is a priority.

One possible solution is greater use of online learning. An analysis of trends in medical education noted that online learning is a rapidly growing field [3], and is forecast to provide 50% of Continuing Medical Education (CME) to practicing health professionals in the next few years. Concurrently, the 'open source' movement has developed, in which educational resources are being made accessible to all without charge. This has resulted in the evolution of new models of education. Previous research into online education has concentrated almost exclusively on American, European and Asian learners [4]. However, globalisation has changed the profile of the archetypal online learner [5], with online education increasing in many regions such as Africa and the Middle East. Though there is a growing body of literature relating to online learners in general, there is a present lack of information regarding the characteristics of successful learners in LMIC settings.

It is recognised that learner outcomes are impacted by a number of factors such as culture, education and online engagement [6]. Understanding these factors is vital for effective teaching and learning through this medium. However, at present little is known about these new student groups [4]. This study aims to assess using commonly collected student data, the indicators associated with successful completion of online learning modules, in learners from LMIC settings.

## II. METHOD

We have conducted an analytical study examining data from two student cohorts from the People's Open Access Education Initiative. The People's Open Access Education Initiative ('Peoples-uni') is a not-for-profit online learning course set up with the aim of providing low-cost, contextually appropriate, internet-based public health education [7-9]. It is targeted primarily (but not exclusively) at health professionals from LMIC settings. After being successfully piloted in 2007 [9] the course now runs 16 different modules and is accredited by the UK Royal Society for Public Health. Over 100 students enroll every semester.

We studied all students who enrolled in Peoples-uni modules starting in September 2009 and March 2010, representing 2 separate semesters. These 2 cohorts were chosen as this provided the most recent, complete year of data available. The students were identified using the Peoples-uni administrative electronic databases. To avoid having linked pieces of data only one module per student was included, so students who were registered to more

than one module during the sampling timeframe, had one module randomly selected for inclusion. Modules being retaken were also excluded, leaving a total of 218 modules taken by different students.

Students are assessed by course facilitators and are deemed to have passed if they have successfully completed the pre-set educational competencies outlined on the programme to the 'Masters level'. This is usually in the form of an assignment and adequate participation in the modules online discussions. Biostatistics is graded on the marks from two assignments, with no requirement for discussion contributions. A contribution to an online discussion refers to contributions made to the topic discussions, and excludes introductory exchanges.

Relevant information on each student was extracted from the Peoples-uni administrative database. The majority of the variables used in this study would be common to what is collected by most online courses. Examples of information collected on the database include gender and level of previous academic achievement. This was done to increase the generalizability of the research.

For each module, data were recorded regarding the student's personal characteristics and proxy markers of engagement with the course. The following personal characteristics were included: gender; country of residence; type of degree level qualification already achieved (if any); highest level of qualification; type of present employment; whether or not they work in health.

Information was collected regarding indicators of engagement with the course. This included whether the student had previously taken a module; if they had taken a module previously whether they had passed a module; the number of contributions to the online discussions they made during the module; during which topic (up to five) was the student's last contribution to the modules online discussion forum; the number of concurrent modules taken by the student; whether the module fee was paid, not paid or waived; whether the student had uploaded a photo to their personal profile (visible to other students and staff); and whether the student had written any personal information on their personal profile.

Results were analysed using the statistics package EPIINFO version 3.5.2. Data was tabulated in 2 by 2 tables for simple correlation analysis, assessing the association between the information recorded and pass rate. Some of the data was further grouped to investigate other associations. This included country of residence, for which countries were grouped into World Bank income levels (using rating given at time of module); UN continent; and World Health Organization region.

Statistical significance of associations between outcomes (pass rate), and the variables measured, was inferred using P-values. For certain variables other tests were used. These included the Chi-square Mantel-Haenszel test for assessing the relationship between passing the module and having previously taken a module.

### III. RESULTS

#### A. Demographics

In total 218 students were enrolled and therefore included in the analysis. There were 93 women and 125 men, with an age range of 22 to 66 and a median of 34 years. Students came from 35 countries. Using World

Bank classifications, over half the students came from lower middle income countries with a combined total of 91% from LMICs. Students also had a wide range of previous educational experience; some had no post graduate training while others had PhDs.

#### B. Personal Characteristics

None of the personal characteristics that were investigated had a significant association with pass rates. This included: UN region of residence; WHO region of residence; income level of country of residence; highest level of education; type of degree level qualification; gender; type of employment; and whether the student works in health. For the breakdown of each category see Table I In our sample, students possessing a medical degree have slightly higher pass rates (30%) than graduates with non-health degrees or health degrees other than medicine (24%,  $p=0.24$ ).

#### C. Indicators of engagement

Students who had previously taken a module had a higher pass rate of 41.5%, over twice that of those who had not, at 19.9% ( $p<0.001$ ). Furthermore, students who have previously passed a module also had a higher likelihood of passing (54.5%), over five times the rate of those that had taken a module previously but not yet achieved a pass, whose pass rate was 9.1% ( $p<0.001$ ). This suggests that those who are more engaged with the course, and hence return, are more likely to pass modules. Furthermore, students who had paid for the module had a pass rate of 37.8%, those who had not paid 16%. Very interestingly, students who had had their fees waived had an even

TABLE I.  
PERSONAL CHARACTERISTICS OF STUDENTS COMPARED WITH MODULE PASS RATES

Indicator	Pass rate (%)	n/N	p value
World Bank income level of country of residence			0.78
High	18.2	4/22	
Middle (Upper)	28.6	2/7	
Middle (Lower)	29.1	34/117	
Lower	27.8	20/72	
WHO region of country of residence			0.35
Africa	28.5	41/144	
Americas	40.0	2/5	
Eastern Mediterranean	44.4	8/18	
Europe	17.6	3/17	
South East Asia	17.2	5/29	
Western Pacific	20.0	1/5	
Highest level of education			0.40
College	25.0	3/12	
University	29.9	26/87	
Post graduate	25.0	29/116	
Not known	66.7	2/3	
Gender			0.46
Female	30.1	28/93	
Male	25.6	32/125	
Working in health			0.20
Yes	28.9	56/194	
No	28.6	4/14	
Not known	0.0	0/10	

lower pass rate at 12.5%. This may represent how a student's level of personal investment impacts upon pass rates.

A clear positive correlation is apparent between the number of contributions made to the module's discussion forum and the student's likelihood of passing (see Table III). This suggests that the more students engage with the course throughout the module the better their outcomes. Similarly, a positive correlation between the last discussion topic the student contributed to and pass rate is also evident (see Table III). This results from the reducing level of engagement of some students as the module progresses. Those whose engagement had tailed off have lower pass rates for the module as a whole. Similarly, students taking another module concurrently had a pass rate of 31.5%, which is 10% higher than that of students only doing one module. This result is less significant than the others.

The pass rate for students who uploaded a photo to their personal profile was 42.1%, compared with 22.4 for those who did not. Similarly, pass rates for students who wrote information about themselves on their personal profiles were 40.2%, compared with 21.9% for those who did not. This is also likely to be a reflection of the engagement with broader aspects of the course, and the importance of creating an 'online self', and is reflected in subsequent pass rates.

## I. DISCUSSION

### A. Main Findings

Engagement is of major importance to successful learning in this context, particularly 'online presence'. Other factors such as personal characteristics are not important. Payment or lack thereof, has a significant impact upon success rates, with students more likely to pass if they have paid. This study also highlights a potential negative impact of providing education completely free i.e. waving fees, as this actually decreases pass rates below that of those who simply did not pay.

### B. What is already known on this topic

Online CME is growing rapidly and will soon account for half of all CME engaged in by practicing physicians [10]. Research regarding learner characteristics is vital for the effective development of online education environments [6]. Multiple personal characteristics have been identified as affecting success [4,6,11,12]. Understanding the interactions of these factors can be complex and difficult, and educational courses should be conceptualised as complex interventions in which multiple human components interact in a non-linear fashions to produce highly context dependent outcomes [13].

Interaction has long been recognised as an important factor in successful online learning [14]. Current research supports this, suggesting that engagement, along with motivation, is a particularly significant factor concerning online learning success [6]. Engagement can have many influencing factors, for example, Sahin [15] suggested that subsidising student fees increases enrolment but decreases student effort. Understanding and valuing interaction and collaborative learning are critical to the success of the online learner [5]. A major reason for this is that building relationships through active participation is thought to im-

TABLE II.  
INDICATORS OF ENGAGEMENT COMPARED WITH PASS RATES

Indicator	Pass rate (%)	n/N	p value
Previous module taken			<0.001
Yes	41.6	32/77	
No	19.9	28/141	
Passed a previous module			<0.001
Yes	54.5	30/55	
No	9.1	2/22	
Number of concurrent modules taken			0.05
None	21.6	19/88	
One or more	31.5	41/130	
Module fee paid			<0.01
Yes	37.8	45/119	
No	16.0	12/75	
Waiver	12.5	3/24	
Photo on personal profile			<0.01
Yes	42.1	24/57	
No	22.4	36/161	
Information about student for others to read on their personal profile			<0.01
Yes	40.2	27/67	
No	21.9	33/151	

TABLE III.  
ONLINE STUDENT ENGAGEMENT COMPARED WITH PASS RATES

Indicator	Pass rate (%)	n/N	p value
Last contribution to online discussion forum			<0.01
Topic 1	5.9	1/17	
Topic 2	0.0	0/9	
Topic 3	23.1	6/26	
Topic 4	37.0	10/27	
Topic 5	61.4	43/70	
Number of contributions to online discussions			
0	0.0	0/69	
1	6.3	1/16	
2	0.0	0/7	
3	27.8	5/18	
4	53.8	7/13	
5	50.0	11/22	
6	50.0	10/20	
7	22.2	2/9	
8	75.0	3/4	
9	60.0	6/10	
10+	50.0	15/30	

act upon learning itself<sup>4</sup>. Social, or 'online', presence is another key factor influencing learner outcomes, with some research suggesting it is the key to success<sup>4</sup>. Creating an 'online self' helps remove the sense of isolation for distance learners and create a sense of community, significantly assisting learning [16]. Subsequently, expert opinion recommends encouraging students to post short autobiographies to encourage engagement [17]. Wright et al [18] found that medical students who provided a photograph for a clinical placement were more likely to pass than those who did not. Although his paper interprets this as proxy marker for organisation, it could also represent the 'presence' and engagement of students and its impact upon outcomes.

### C. What this study adds

Globalisation has radically altered the profile of the archetypal online learner [5]. There has been an increase in the heterogeneity of learners on ethnic, cultural and educational grounds [19]. Although there has been this demographic shift, there is a lack of research concerning newer groups of learners [4], including those from predominantly LMICs. The Peoples-uni creates a novel learning environment, bringing together and providing education for a new group of online learners. This research highlights the importance of engagement and social presence in the success of students in this relatively novel learning environment. By using proxy markers that are easily accessible, we have shown how readily available information is significantly related to success rates, which could be used by course providers to monitor and develop their courses.

### D. Personal characteristics

The lack of correlation between the personal characteristics investigated and pass rates, may result from the significant heterogeneity of participants that share anyone of these characteristics. For example, a student with a low level of education may be highly motivated to gain the accreditation; others may not be academically capable at present. Similarly, students with high levels of education may pass without being too challenged, or not complete the module as they have little to gain from accreditation. The lack of correlation between country of origin and pass rates may actually represent a commonality between students. Participation requires regular access to a computer, and a certain degree of computer literacy. Therefore, the students may actually have more in common with each other than their countries as a whole do. It is likely that the causal pathways linking each of these variables with module completion may be too complex for an effect to be seen using this form of investigation.

### E. Indicators of engagement

This study builds on previous research suggesting the importance of engagement and active participation as highly important factors regarding learner outcomes [4,5,14], by highlighting the importance of these factors in this student group. The higher pass rates seen in returning students could have a number of explanations. Returning students are more likely to value the course and understand the standard of work necessary to pass. This is not to say that those taking modules for the first time do not have these characteristics, rather that returning students are a more concentrated group of people that are likely to succeed. Previously passing a module indicates students have already engaged with the course sufficiently, and at a high enough level to pass. Therefore, they are aware and capable of the level required and value gaining accreditation sufficiently to work for a pass again. Individuals who have previously taken a module but not yet passed may still be developing their work up to a level sufficient to pass, or not engaging with the course sufficiently to understand what is required. This is further supported by the relationship between pass rates and discussion engagement seen here. Beyond representing engagement alone, the discussions also improve learning, as within the discussion forums, course materials are considered and issues debated, helping students acquire the necessary competencies to pass the module. It should be noted that we did not assess the standard or length of contributions. This indicates

engagement itself is the important feature. The development of an online self (photo and personal info) and its relationship to pass rates corresponds with previous research [4,16], adding support to our proposition of the fact that having a photo is a proxy indicator of engagement. The importance of personal investment is also seen regarding payment. Students receiving waivers had the lowest pass rate, indicating that they do not value what they have not paid for, and beyond this, value what has been given for free even less corresponding with the work by Sahin [15]. The positive correlation between taking multiple modules and passing may result from higher frequency of interactions and level of engagement that concurrent modules require. However, it is logical that the students engaging with the course more regularly, which would be required if taking multiple modules, would have better pass rates.

### F. Limitations of this study

The associations found in this study may not be causal. In addition the results do not provide clear evidence for the direction of causation - students may be more likely to pass because they engage more, or engage more because they are academically strong and find engaging easy. It is likely that there is a complex causal relationship between successful completion of modules and the characteristics of online learners. This relationship is also likely to be multi-factorial [13]. That said, the findings of this study echoes research described regarding the importance of certain learner characteristics and their impact upon learner success.

Bias from module effects could result from variation in the difficulty of modules. However, students are unlikely to be able to assess variation in module difficulty before enrolling and all modules were used to minimise this. To access this formally, each module could be analysed independently investigating if the findings of this study are still present.

## II. CONCLUSION

There is clearly an important role for continuing professional development delivered by distance learning as a means of capacity building, especially in resource constrained settings. A generic approach to the delivery of public health education will not meet the educational needs of all students as crucially not all students are the same and their work settings will differ considerably. As such, an understanding of the factors related to successful online learning is necessary for the development of this medium of teaching and learning. Only then can we optimise the educational value of this medium for the benefit of our students.

### ACKNOWLEDGMENT

The authors thank Professor Heller of the Peoples-uni for his support in facilitating this work.

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Received 23 August 2011. Published as resubmitted by the authors 22 November 2011.