

The Role of Different Subject Materials on the Admission of PhD Candidates of Epidemiology, Bacteriology and Parasitology during 2006-2007

Background: Score worksheets have been extracted for PhD candidates in Epidemiology, Microbiology and Parasitology for the academic year of 1386-87. The main objective in this study is the impact and importance of different subjects on the discrimination results of admission.

Methods: Extracted scores from worksheets are analyzed by MINITAB15 statistical toolbox. The regression values of different subjects were extracted and sorted for each branch of study. All subject correlation coefficients were calculated in comparison to overall candidate performance. A redundancy measure was suggested on the basis of correlation of different subject performances. The distribution box plots were shown for different subject to visualize comparison.

Results: The repeatability and redundancy between different subjects were high in bacteriology. The different subjects in this branch of study had efficient and equal impact on discrimination. The bacteriology as a subject had shown lowest significance in epidemiology, therefore it has the lowest taxonomy. The bacteriology and fungicide subject despite its low weight showed the highest impact of 6.44 in parasitology.

Conclusion: In this study we realized that in branches such as epidemiology different subjects have equal impact. In subject cases which the significance of impacts are very low, there should be further consideration and analysis on the subject matter to whether wave the subject. In parasitology branch bacteriology and fungicide subject has higher impact on discrimination, it is worth to increase its weight and the number of questions on the subject.

Keywords: Score Coefficients, Written Exam, Basic Science, Subject Correlation, Density Distribution

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درابه تأثیر موضوعات المختلفة الدرابه فی قبول طلاب مرهله الدكتوراه فی فروع البكتيريا و البيئه و الطفيليات فی عام ۱۳۸۶-۸۷

التمهيد و الهدف: تم السعي في هذه الدرابه الى معرفة مستوى اليجابه عند البشتركين في فحص الدكتوراه لعام ۸۶-۸۷ في فروع البكتيريا و الطفيليات و البيئه لذن هذه الفروع يوجد فيها اشتراكات درابه اكترو يوجد في هذه المجالات عدد اكبر من البشاركين. ان الهدف هو دراسته مستوى الوزن و المواضيع المختلفة من حيث التقييم في تقييم العملي للبشاركين .

الاطلوبه: في هذه الدرابه استخدم برنامج Minitab15 لتحليل و العوده اللفقيه بين الدروس المختلفة و العلامه الكتيبه في كل من الدروس و بعد ذلك تم استخراج الترابط بين الموضوعات المختلفة و تم تخمين الراهيه. تم استخدام الرسم البياني لتوضيح هذا الامر.

النتائج: قابليه التكرار و قابليه الاطمئنان كانت عاليه في فحص البكتيريا. كان هناك علامه منخفضه في درس البكتيريا فحص البيئه و كان يعتبر من الدروس الصعبه و لم يكن مؤثر قابل للتفكيك عند البشركين. في فحص الطفيليات كان هناك ضرب واحد لدرس البكتيريا و الفطر و كان الضرب اعلى من 6.44.

النتيجه: في هذه الدرابه نستطيع ان نلاحظ درجه التكرار بين الدروس و نلاحظ العله. يدل التأثير الكبير لدروس البكتيريا و الفطريات في فحص الطفيليات على الصيه الموضوع. يساعد هذا الدرس على تفكيك المتقدمين بطلب الفحص بشكل اسلم و اوضح. و ايضا هناك مجال تأمل و نظري تأثير درس البكتيريا في فحص البيئه .

الكلمات الرئيسي: دورضرب الدرس. الفحص الكتبي. العلوم الراهيه. ترايط الموضوعات. توزيع المعلومات.

پيراسيتالوجی، بيكتريالوجی، اور اپيدی میولوجی کے شعبوں میں داخلے کے لئے دیگر موضوعات کی تاثیر

بيک گراؤنڈ: اس تحقيق میں بيكتريالوجی، پيراسيتالوجی اور اپيدی میولوجی کے طلباء کی تعليم پر دیگر موضوعات کے اثرات کا جائزہ لیا گیا ہے۔

روش: اس روش میں سب طلباء کے نمبروں کا منی ٹیب پندرہ سے جائزہ لیا گیا اور ريگوریشن کے بعد ہر موضوع کے نمبروں کا جائزہ لیا گیا۔ اس کے بعد اضافی موضوعات میں حاصل شدہ نمبروں کا بھی جائزہ لیا گیا اور امتحان میں ان کی اہمیت کی جانچ کی گئی۔ باکس پلائس میں نتیجے ظاہر کئے گئے ہیں تا کہ موضوعات کی اہمیت کا اندازہ ہو سکے۔

نتائج: بيكتريالوجی میں موضوعات کی تکرار کی بھر پور توانائی پائی جاتی ہے۔ اپيدی میولوجی میں بيكتريالوجی کی کوئی خاص اہمیت ظاہر نہیں ہوئی۔ پيراسيتالوجی میں بيكتريالوجی اور فنگس کی شناخت کے مسائل کسی حد تک کام آتے ہیں۔

سفاوش: اس تحقيق میں یہ واضح ہوا ہے کہ اپيدی میولوجی پر مختلف طرح کے موضوعات اثر انداز ہوتے ہیں۔ جن موضوعات کے اثرات کم ہیں ان پر نظر ثانی کی جانی چاہیے۔ پيراسيتالوجی میں بيكتريالوجی اور فنگس کے موضوعات کو زیادہ کور کرنا چاہیے تا کہ بہتر نتیجے حاصل ہوں۔

کلیدی الفاظ: امتحانات، بيكتريالوجی، پيراسيتالوجی۔

بررسی نقش موضوعات مختلف درسی در پذیرش دانشجویان دوره دکتری در رشته های انگل شناسی، باکتری شناسی و اپیدمیولوژی ورودی ۸۷-۱۳۸۶

زمينه و هدف: در این مطالعه سعی شده که روند پاسخگویی داوطلبان آزمون دکتری سال ۸۷-۸۶، رشته های باکتریشناسی، انگلشناسی و اپیدمیولوژی که اشتراک درسی بیشتر و تعداد داوطلب بیشتری نسبت به دیگر رشته ها برخوردار بوده اند، بررسی گردد. هدف بررسی وزن و تعیین کنندگی موضوعات مختلف در ارزیابی علمی داوطلبان میباشد.

روش: در این بررسی نمره کتبی استخراج شده از کار نامه داوطلبان را با استفاده نرم افزار MINITAB15 تجزیه و تحلیل و رگرسیون خطی بین دروس مختلف و نمره کتبی ضرب هر کدام از دروس را استخراج نموده و سپس همبستگی بین موضوعات مختلف را استخراج نموده و اهمیت آنها را در آزمون مربوطه حدت بزنییم. با استفاده از نمودار جمعی ای سعی کردیم که نقش هر کدام از دروس را با توجه به توزیع دهک های مربوطه بررسی نماییم.

یافته ها: در آزمون باکتریشناسی تکرار پذیری و قابلیت اطمینان جمعی بالا است. در آزمون اپیدمیولوژی درس باکتریشناسی از نمره پائینی برخوردار و برای داوطلبان دشوار و از شاخص قابل ملاحظه ای در تفکیک داوطلبان برخوردار نیست. در آزمون انگلشناسی درس باکتری و قارچ با ضرب یک از ضرب تاثیر بالای ۶/۴۴ برخوردار است.

نتیجه گیری: در این بررسی به درجه تکرار بین درسی دردروس مختلف پی برده و میتوان علت را بررسی نمود. تاثیر بالای درس باکتری و قارچ در آزمون انگل شناسی بیانگر اهمیت و زیربنائی آن است. این درس با ضرب بالاتر در تفکیک داوطلبان میتواند نقش اساسی را ایفا کند. همچنین عدم تاثیر قابل ملاحظه درس باکتریشناسی در آزمون اپیدمیولوژی جای بررسی دارد.

کلید واژه ها: نقش ضرب دروس، آزمون کتبی، علوم پایه، همبستگی موضوعات، توزیع دانسته ها

INTRODUCTION

In most countries university admissions are based on the previous applicant performance. But in some countries such as India there is a special exam called GATE, or in China there is Goa Koa, the most competitive in the world. In Iran also, there are several competitive entrance exams (1,2).

This exam has been generalized for the admission of almost all of university branches. This area seems to have involved a vast majority of Iran's population, but there are not any distinct published research works in this area. The possible reason for this shortage could be the access restriction to the consensus and results of these exams.

Fortunately, in the case of this study applicant performance worksheets were available on the official site of Ministry of Health and Medical Education for the proposed year of study. The author of this report has been involved in one of the exam committees of the board of exam for almost twelve years. Therefore, it was realised that published researches in this area are few and it was worth investigating worksheets thoroughly.

One of the major issues in an exam could be the subject permutation in the exam sheet, or the taxonomy order(3-6). In competitive exams there are different effective factors which challenge applicant mentality. One of the mentality issues is the coverage of background study experience of the applicant with exam materials. Another issue could be the consistency of exam references all over the country. The other issue could be the board of exams' familiarization with new references. The tough competition and former issues result in big competitive market for private institutes. There are huge social consequences laid down behind it. The matter of either acceptance or rejection causes mental conflicts for the rejects and suspicious judgment follows.

One of the anxieties in the exam is the exam time plan for applicants. Irregular question taxonomy permutation could suppress moderate prepared applicant performance. Entangled taxonomy in all questions reduces exam result contrast for applicant discrimination. Therefore the exam output bend toward inconsistency. The unveiled procedure and analysis of the data could satisfy rejects and avoid their rumor for examiners and committees of the exam. In this study it is supposed to investigate the statistical parameters of applicants in some branches of study which have more common subjects and moderate number of attendance. It is proposed to find inter correlation between different

subjects in each branch of study. Also the discriminate factor of each subject is to be considered.

METHODS

By the investigation of all 29 branches of study in the proposed Iranian educational year of study (86-87) in Ministry of Health and Higher Education, it was found out that three branches of study had more common subjects and applicant attendance. Targeted branches were bacteriology, parasitology and epidemiology. Mark sheets of all applicants in these three areas were downloaded and sorted for each subject (7,8). Subjects in bacteriology were bacteriology(M1), virology(M2), parasitology and mycology(M3), biochemistry(M4), molecular biology(M5) and immunology(M6). In parasitology, the subjects were cetology(M1), helminthology(M2), medical insectology(M3), hematology(M4), immunology(M5), bacteriology and mycology(M6) and biochemistry. Subjects in epidemiology were biostatistics(M1), epidemiology(M2), parasitology and mycology(M3), bacteriology(M4), virology(M5) and immunology. The max score level in all subjects was 100 in percentage. Statistical investigations were carried out through Minitab 15 statistical tool box(9).

RESULTS

Most of the subject mark distributions are close to normal distribution therefore mean value and all of all of subject marks are listed in table 1.

Total earned score of written exams are evaluated versus mark subjects through linear regression analyzer. Their equations are as follow.

Scores for bacteriology: - 0.00038 + 2.24 M1 + 0.450 M2 + 0.450 M3 + 0.450 M4 + 0.450 M5 + 0.450 M6

This equation was extracted from work sheets of 68 bacteriology candidates.

Scores for parasitology: 0.680 + 1.79 M1 + 1.81 M2 + 0.592 M3 + 0.605 M4 + 0.591 M5 + 0.574 M6 + 0.605 M7

This equation was extracted from work sheets of 50 parasitology candidates and the following equation is extracted from 38 worksheets of epidemiology.

Score for epidemiology: - 0.00038 + 2.24 M1 + 0.450 M2 + 0.450 M3 + 0.450 M4 + 0.450 M5 + 0.450 M6

By observing the extracted equation for bacteriology it is obvious that the score weight of the first subject(M1) is five times of the other subjects in this branch of study. Therefore the most important and discriminative subject could be bacteriology in this branch. By looking at the regression equation of parasitology we will find out the

Table 1: Statistical parameters of different subject scores in different branches of study

	(score)	(M1)	(M2)	(M3)	(M4)	(M5)	(M6)	(M7)
Bacteri-	146±71	31±17.7	41±22.3	27±19.1	41±23.5	18.3±16.7	42.8±27	-----
Parasit-	290±96	53.7±21	43±17	62±17.2	33±20.3	32.7±33	25.7±10	39.5±23
Epidem-	218±92	57±20.5	29±15.8	19±14.2	-0.4±8.4	31±22	21.5±22	-----

weight score of the first(M1) and second(M2) subjects are triple times of other subjects in this branch of study. Therefore, these two subjects could have more impact than the other on the acceptance discrimination. Also in this respect, by taking a look at epidemiology equation it is realized that the first(M1) and second(M2) subjects are

weighted twice the others. In comparison to other two former branches of study, in epidemiology the subjects are more balanced.

With the correlation tool the correlation between subjects and total score are extracted. Subject importance is extracted with respect to their P-Value.

Table 2: Pearson correlation coefficients of each subject with total score in bacteriology.

	M1	M2	M3	M4	M5	M6
Corr(score)	0.94	0.73	0.55	0.79	0.53	0.78
P-Value	0.00	0.00	0.00	0.00	0.00	0.00

Table 3: Linear regression of score versus single subjects.

Bacteriology	Parasitology	Epidemiology
$Score = 28+3.79M1$ $= 50+2.33M2$ $= 90+2.1M3$ $= 47+2.4M4$ $= 104+2.27M5$ $= 61+2.0M6$	$Score = 179+2.8M1$ $= 72.3+5.0M2$ $= 149+2.27M3$ $= 244+1.37M4$ $= 219+2.16M5$ $= 124+6.44M6$ $= 178+2.8M7$	$Score = -0.1+3.82M1$ $= 78.4+4.86M2$ $= 137+4.3M3$ $= 219+2.67M4$ $= 131+2.8M5$ $= 160+2.68M6$

Table 4: Pearson correlation coefficients of each subject with total score in parasitology

	M1	M2	M3	M4	M5	M6	M7
Corr(score)	0.86	0.90	0.40	0.29	0.74	0.66	0.67
P-Value	0.00	0.00	0.00	0.04	0.00	0.00	0.00

Table 5: Pearson correlation coefficients of each subject with total score in epidemiology

	M1	M2	M3	M4	M5	M6
Corr(score)	0.86	0.84	0.66	0.25	0.68	0.64
P-Value	0.00	0.00	0.00	0.14	0.00	0.00

Table 6: Pearson correlation M4 with other subjects in epidemiology

	Total(score)	M1	M2	M3	M5	M6
Corr(M4)	0.25	0.14	0.40	0.08	0.12	0.27
P-Value	0.14	0.39	0.81	0.63	0.47	0.10

Box plots are plotted for all the three exam branches. These box plots are showing decade distribution of different subjects against each other.

DISCUSSION

As correlation coefficients of different subjects with total score in table 2 and table 3 and their statistical distribution in figure 1 show, exam subjects in bacteriology are reasonably balanced. Also small P-Values of correlation coefficients are in agreement with reasonable balancing. In bacteriology the correlations within subjects are comparably high with small P-Values. Therefore, there could be some information redundancy between different exam material subjects.

In parasitology as it is given in table 3 and shown in figure 2, the bacteriology and mycology subjects are(M6) highly weighted in one directional linear regression. Its coefficient is 6.44, which in comparison to other subjects is very large. If we look at its correlation with other subjects in

parasitology as given in table 4, we will find that it is highly correlated with cetology(M1) and helminthology(M2) which have weighted by three. It could be concluded that the exam material of this subject should be repeated and redundant to these two subjects. As the overall score highly correlated with this subject(M6), there should be a close look at question paper or the material overlap in these subjects.

In epidemiology branch of study, bacteriology as given in table 1 earned minimum regression coefficient value(-0.4) and lowest standard deviation. It means that this subject has the lowest contribution in total score and lowest discrimination impact. On the other hand it has the lowest correlation with other subjects in this branch as it is shown in figure 3 and given in tables 5 and 6. Therefore, this subject either is strange to applicants or its taxonomy is ill organized.

CONCLUSION

Inter subjects overlap and redundancy could be guessed by correlation coefficient investigation between different subjects. The high redundancy between subjects could be effective and less discriminative. A subject is while less discriminative which could enhance the overall score variation. In this study we found out that bacteriology and mycology in parasitology against its low score weight has earned the highest correlation with total score. Therefore it is either the core subject for this branch or wrongly designed in this exam. Also we found that the bacteriology subject had the lowest correlation with the total score and other subjects. Therefore this subject is either strange to applicants or its taxonomy is ill organized. In the case of unfamiliarity of applicants it should be omitted or in case of improper taxonomy, concerned board of exam should be informed. In the end it is suggested that for the generalization of this study, previous years and next year exams data be considered.

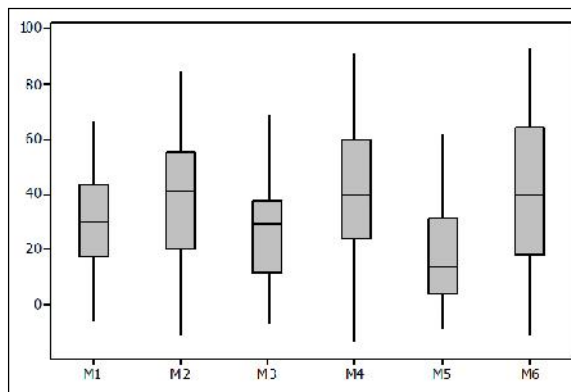


Figure 1: Box plot of different subjects in bacteriology

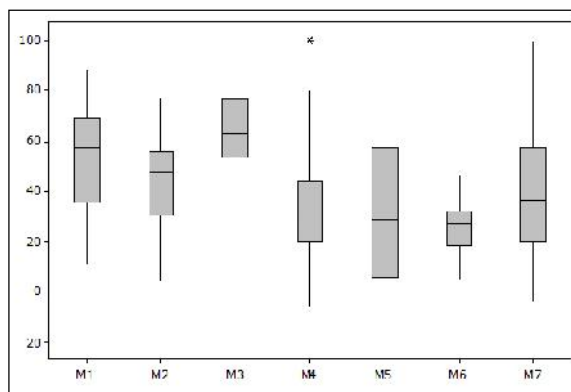


Figure 2: Box plot of different subjects in parasitology

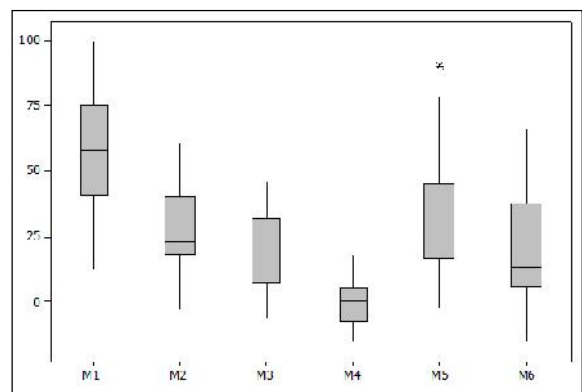


Figure 3: Box plot of different subjects in Epidemiology

REFERENCES

4. Official site of GATE. (Graduate Aptitude Test In engineering) IIT Bombay Organizing GATE 2013. Available from: <http://www.gate.iitb.ac.in/gate2013/>
 2. Zhang JB. National university entrance examination for China. Physics Teach 1994; 32(3): 187-9.
 3. Shafiei F, Moradi A, Forouzandeh MH, Foroughi A, Akbari M. Evaluation and

- comparison the results comprehensive exam and the mean scores of basic sciences courses of Isfahan medical students before and after the changes of basic science courses. Iranian journal of medical education 2011; 10(5): 1177-87. [Persian].
7. Javadi M. Assessment of the results of basic science exams of medical students in Qazvin University.
8. Journal of Qazvin University of Medical Sciences 2001; 5(2): 69-75. [Persian].
9. Sorati M, Bazargan A, Hejazi E. Assessment of effective factors in medical students' achievement of Arak University of Medical Sciences in pre-internal exam. Rahavard Danesh 1999; 2(8): 15-22. [Persian].
10. Hashemian M, Shuride Yazdi M, Azizi H, Hassanpour K. Internal evaluation of basic science department in Sabzevar University of Medical Sciences in 2010. Future of medical education journal 2012; 2(3): 24-7.
11. Mehridehnavi AR. The association between interview and written exam in graduate student admission of medical education and rehabilitation management. Iranian journal of medical education 2009; 8(2): 315-21. [Persian].
5. Educational chancellor of Ministry of Health, Treatment and Education of Medical Sciences. PhD. results. Available from: http://dme.hbi.ir/payeh/natayj/natayj_PhD.htm. [Persian].
6. Devore J, Peck R. Statistics, the exploration and analysis of data, Award to the wise: Cautions and limitations. 5th ed. Cole: Thomson books; 2005: 241-2.

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