

Designing a bank of questions in the subject of statistics for students of the Faculty of Physical Education, Sadat City University, using the Rasch model according to the theory of response to the test item
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In fact, extrapolating the results of scientific research indicates the importance of question banks, and it is recommended to develop them.. This meaning has been confirmed

The International Item Bank project is another important development in the field of evaluating educational achievement at the international level. It is one of the international projects initiated by the International Association for the Evaluation of Educational Achievement (IEA) in cooperation with the Center for Evaluation Studies at the University of California Center For the Study of Evaluation (CSE). Twenty member states of this international association participated in this project, which began in 1980.

This project focused on building an international center and an item banks network that would assist in the development of methods and processes for evaluating educational achievement in member states. The officials of this association believed that building an international question bank connected to the question banks of each country

would lead to the creation of classification systems for questions and their psychometric characteristics on international common scales so that it would be easy for all member states to use, and it would be flexible enough to conform to the educational systems in these countries. It also helps in obtaining comparative data on certain educational aspects in different countries.(9) ”

There is no doubt that "the relative advantages and disadvantages of these banks depend on the purpose of their establishment, the nature of their uses, the conditions of these uses, the general shape and level of the bank, the resources available for testing operations, and the acceptance of educators and parents of the processes of developing systems and methods of evaluation and examinations.(10) ”

This, and Egyptian public opinion has been preoccupied - and still is - with this issue. Investigations and press articles appeared about it.. One of them wondered, "The Question Bank... Does it end exam errors?!" (11). Another emphasized that

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"question banks...the perfect solution" (12). A third pointed out that "the bank of questions ... without Benefits" (13). A fourth went to the fact that "the question bank ... solves the problem of exam errors and correction", and wonders: The first system for digital exams .. when will its experiment begin.(14) !?

Previous journalistic articles and investigations, and dozens of others, highlight the public opinion's interest in the issue of education in general, and the development of evaluation policies and systems at the secondary level through question banks in particular, and are in line with what is being achieved in developed countries. The question that may come to mind is:

.1An active movement has grown in Egypt in the field of preparing question banks in various academic subjects, especially after the establishment of the National Center for Examinations and Educational Evaluation, and in response to the recommendations of some studies and conferences to establish question banks in various subjects based on scientific bases for the final evaluation.

Research problem:

The problem of the current research stems from a tangible

Egyptian reality that was exposed to many articles, journalistic investigations, and some studies, as well as the Secondary Education Development Conference - as previously explained, so that the body of "question banks in the secondary stage" was exposed; To reveal to us facts - positive and negative - that are the first building blocks in reforming and developing the calendar and organizing it in the bachelor's degree.

The researcher noticed, through his review of the question bank in statistics at the undergraduate level in the academic year 2021/2022 AD, that many of the questions lack accuracy... and that there is a contradiction between some of the questions and the answers contained below, and then confidence in their value is shaken... bearing in mind that these questions may Formulated by specialists in the field of teaching statistics!!

The current research represents an initial attempt to evaluate the question bank in statistics at the undergraduate level. The main objective of the research is to collect data and information about the question bank in statistics at the undergraduate level. In light of this data, it is possible to examine the direction towards which this bank is

heading in the light of the specifications of the general secondary exams.

Thus, the research problem is defined as follows:

Evaluating the question bank in statistics at the undergraduate level in the light of the specifications and scientific standards for the examination papers for these subjects that were determined by the National Center for Examinations and Educational Evaluation in terms of its consistency with these specifications and standards set.

research aims:

The current research aims - in light of the above - to the following:

- .1Evaluating the current reality of the question bank in statistics at the undergraduate level in light of the specifications; To reveal the strengths and weaknesses of this bank... in a way that helps in its development.
- .2Identify the types of questions included in the question bank in statistics at the undergraduate level, and the percentage of each type.
- .3Identifying the extent of the knowledge depth of the question bank in statistics at the undergraduate level in terms of remembering, understanding, applying, analyzing, constructing, and evaluating.

.4Exposing and analyzing examples of common errors in the question bank in statistics at the undergraduate level. To stand (to identify) the reasons that led to making these mistakes.

.5Presenting a proposed scenario for developing the question bank in statistics at the bachelor's level.. and embodying this perception with examples of guiding questions that represent a key to developing this bank.

Search questions:

In light of the above, the research questions can be identified in the following five questions:

- .1What is the reality of the question bank in statistics at the undergraduate level in the light of exam specifications?
- .2What types of questions does the question bank include in statistics at the undergraduate level? What is the percentage of questions for each type? What are the knowledge levels measured by the question bank in statistics? What is the percentage of questions that measure these levels?
- .1What are the most common errors in the question bank in statistics at the undergraduate level?
- .2What is the suggested scenario for developing the question bank in statistics at the undergraduate level?

search terms:**-1Calendar:**

"It is the issuance of a judgment on the extent to which educational goals are achieved and the treatment of the effects caused by some factors and circumstances in facilitating or disabling access to these goals. In other words, the issuance of judgment in the educational evaluation is followed by a practical procedure related to the improvement of educational science .(21)

-2Question Bank:

"It is an integrated system that allows questions to be recalled from the Item Pool questions repository fully automated, according to general and special statistical specifications that ensure the formation of more than one test image with the same specifications in a particular subject, and in which the questions have a high degree of honesty, stability and ability to distinguish.(5) "

-3Evaluating the question bank:

The purpose of evaluating the bank of questions in statistics in the undergraduate level in this research is: analyzing the content of these questions in the light of the specifications of the examination

papers for high school; To come up with quantitative and qualitative judgments on them in the light of these specifications, and to make some recommendations and suggestions for developing the question bank in light of the results of the analysis process.

Research Methodology:

The approach that this research adheres to is the descriptive approach based on monitoring and analyzing the reality of the research problem. The researcher also uses the content analysis method as one of the main tools of the descriptive approach.

Search Plan:

Based on the foregoing, the research plan comes in seven main parts - after submission - as follows:

First: A theoretical study that includes a brief overview of the question banks.

Second: the research sample.

The research sample was selected from undergraduate students at the Faculty of Physical Education

Second: the research sample:

The sample includes all the questions included in the question bank for statistics at the bachelor's level in 2021/2022 AD.. The number of questions reached (1264), distributed in the following table:

Schedule (1)
The number of questions contained in the question bank in statistics in the undergraduate level

Total	11	10	9	8	7	6	5	4	3	2	1	n
435	-	-	-	60	-	62	77	102	80	-	54	1
415	-	-	-	-	129	61	62	-	25	57	81	2
190	-	-	170	-	-	-	-	-	20	-	-	3
31	-	-	-	-	-	-	-	-	-	-	31	4
153	50	60	-	-	-	-	-	-	-	-	43	5
40	-	-	-	-	-	-	-	40	-	-	-	6
	1264	50	60	170	60	129	123	139	142	125	57	total

Table (1) shows the number of questions for each participant in preparing the question bank.(*)

Third: the search tool:

Fourth: Evaluating the question bank in statistics at the undergraduate level in light of the specifications:

The content analysis method was used as a means of judging the question bank in undergraduate statistics; The method of content analysis is one of the methodological scientific research methods that are used in education for quantitative and qualitative judgment on the content of a curriculum, or to judge the question bank by analyzing this curriculum or this bank within the framework of specific steps as follows:

.1Determining the purpose of the analysis process: The analysis process aimed at the question bank in statistics in the undergraduate level, to know the availability of the specifications of the exam papers for philosophical subjects in this bank.

.2Analysis sample: The analysis sample - as previously explained - in this research consisted of a bank of

questions in statistics at the undergraduate level in the academic year 2021/2022 AD.

.3Determine the unit of analysis: Each question in the bank was considered as a unit of analysis, through which the recurrence of the phenomenon in which the content is to be analyzed appears.

.4Determine the categories of analysis: it means the main or secondary elements in which the units of analysis have been placed, and in which each characteristic of the content can be placed, and classified on its basis.(34)

The categories of analysis here are the specifications of the examination papers for philosophical subjects, which must be available in the question bank in statistics at the undergraduate level.

The following is a scientific analysis of the question bank in statistics at the undergraduate level in light of the specifications:

The first axis: the general statistics in light of the specifications picture of the question bank in of the examination paper

Schedule(2)

specification of the examination paper	each level, percentage,	Number of questions	Cognitive level	م	Examination paper specification	each level, percentage,	Number of questions	Question type	No
%33	%22.86	40	to remember	1	Objective questions (correct	%9.71	17	Multiple-choice	1
%33	%61.71	108	Understanding	2	An error with reasoning or selection	%24	42	Right and wrong	2
%9	%2.29	4	Application	3	from multiple with reasoning) 33%				
المستويات العليا	%1.71	3	analysis	4	-	-	-	mating	3
%25	%1.14	2	installation	5	-	%1.14	2	completion	4
	%10.29	18	Evaluation	6	%67	%65.14	114	Short article	5
	-	-	solve problems	7	-	-	-	Long article	6
175			Total questions bank		175			Total questions bank	

From the previous table it is clear that:

.1The question bank in statistics does not conform to the specifications of the examination paper prepared by the National Center for Examinations and Educational Evaluation.

.2The bank was not filled with a wide range of questions (175 questions only). To focus on short essay questions.

.3Many of the Bank's questions deal with students only as a memory; It focuses on the lower levels, where it is dominated by remembering by 22.86%, and understanding by 61.71%.

As for the questions of application (as an application) to deepen understanding, they are very limited by 2.29% .. without paying attention to the higher levels such as analysis, synthesis, evaluation and creativity.

.4The Bank neglected questions that require the use of learned philosophical ideas in interpreting situations and solving contemporary life problems.

The second axis: the general picture of the question bank in logic in light of the specifications of the examination paper:

Table (3)

specification of the examination paper	each level, percentage,	Number of questions	Cognitive level	μ	Examination paper specification	each level, percentage,	Number of questions	Question type	No
to remember	1	Objective questions (correct	%9.71	17	Multiple-choice	%33.9	80	Multiple-choice	1
Understanding	2	An error with reasoning or selection	%24	42	Right and wrong	%24.58	58	Right and wrong	2
Application	3	from multiple with reasoning) 33%							
analysis	4	-	-	-	mating	-	-	mating	3
installation	5	-	%1.14	2	completion	-	-	completion	4
Evaluation	6	%67	%65.14	114	Short article	%41.53	98	Short article	5
	-	-		7	-	-	-	Long article	6

From the previous table it is clear that:

.1The bank of questions in logic does not conform to the specifications of the examination paper

.2The bank was not filled with a wide range of questions (236 questions only). To focus on short essay questions.

.3Almost all of the Bank's questions focus on the lower levels; Remembering is 10.17%, understanding is 50.42%, and application is 38.98%.. with almost complete disregard for higher levels such as analysis, synthesis, evaluation and creativity.

.4The Bank neglected questions that require the use of learned logical ideas in interpreting situations and solving contemporary life problems.

From the previous table it is clear that:

.1The question bank in statistics does not conform to the specifications of the examination paper

.2The bank was not filled with a wide range of questions (132 questions only). To focus on short essay questions.

.3The bank focuses on the types of questions that measure the lower levels (remembering, understanding, application) by more than 70%.. without sufficient attention to the upper levels, noting that this bank is in statistics and logic (the high level)!!

.4The bank neglected - to a large extent - questions that require the use of learned philosophical and logical ideas in interpreting situations and solving contemporary life problems.

•Arithmetic mean - median - standard deviation - skewness - correlation

coefficient - difficulty coefficient - coefficient of excellence - Cernbach's alpha

•The researcher used the statistical program (WINSTEPS) to analyze the data based on the theoretical basis of the Rasch model using the program - Estimating Vocabulary Difficulties - The researcher used the equation of negation = 5 logit + 50

Presentation and discussion of the results:

-1The results of analyzing and grading the vocabulary of the test images that make up the collection bank for the statistics subject.

The presentation of the results of the analysis and grading of the vocabulary of the test images that make up the collection bank for the subject of statistics includes the presentation and discussion of the steps and the results of the analysis that were reached to obtain:

-Final grading of the vocabulary of each of the five pictures that make up the bank according to its difficulty using Rasch model as one of the response theory models for the word.

In order to answer the question, what is the gradation of the difficulties of the vocabulary of each test image of the measurement and evaluation material scale?

Each test picture was re-analyzed with the total bank of the achievement scale for the subject of statistics, considering the vocabulary of each picture as common vocabulary with the bank as a whole, after deleting the individuals and vocabulary that are not appropriate to the principles of objective measurement.

The following is a presentation of the results of answering the research questions.

Results of answering the first question:

The first research question states:

What is the grading of the difficulties of the vocabulary of each test image of the measurement and evaluation material scale?

Below is a presentation of the results of ranking the five test images separately.

A- The final grading of the vocabulary of the first test form of the achievement scale of the statistics subject

The following table (6) includes the final grading of the items of the first image of the achievement scale for statistics, arranged according to their difficulty in the logit and minf units, in addition to the standard error estimated in the logit and minf units, after deleting the individuals and vocabulary that are not appropriate for the objective measurement bases.

Schedule (6)
achievement scale for the subject of statistics

rating	Difficulty	number	rating	number Difficulty	Single code
0.3	0.06	40.25	-1.95	19	C1
0.8	0.16	41.35	-1.73	2	A2
0.3	0.06	41.95	-1.61	45	C16
0.75	0.15	42.1	-1.58	34	A34
0.75	0.15	42.35	-1.53	16	A16
0.75	0.15	42.55	-1.49	48	A48
0.25	0.05	42.95	-1.41	36	C11
0.25	0.05	43.15	-1.37	20	C2
0.25	0.05	43.3	-1.34	23	C5
0.75	0.15	43.5	-1.3	14	A14
0.75	0.15	44.05	-1.19	17	A17
0.75	0.15	44.25	-1.15	12	A12
0.75	0.15	44.5	-1.1	11	A11
0.75	0.15	44.5	-1.1	15	A15
0.25	0.05	44.5	-1.1	37	C12
0.25	0.05	44.9	-1.02	26	C8
0.75	0.15	45.15	-0.97	5	A5
0.75	0.15	45.25	-0.95	6	A6
0.75	0.15	45.8	-0.84	7	A7
0.25	0.05	45.9	-0.82	22	C4
0.25	0.05	46.1	-0.78	38	C13
0.75	0.15	46.75	-0.65	9	A9
0.25	0.05	47	-0.6	25	C7
0.25	0.05	47.1	-0.58	28	C10
0.25	0.05	47.6	-0.48	21	C3
0.75	0.15	47.7	-0.46	4	A4

**Follow Schedule (6)
achievement scale for the subject of statistics**

rating	Difficulty	number	rating	number Difficulty	Single code
0.75	0.15	47.85	-0.43	18	A18
0.75	0.15	48.35	-0.33	29	A29
0.75	0.15	48.7	-0.26	40	A40
0.25	0.05	48.85	-0.23	24	C6
0.25	0.05	49.45	-0.11	27	C9
0.75	0.15	49.5	-0.1	3	A3
0.75	0.15	49.5	-0.1	49	A49
0.75	0.15	50.15	0.03	41	A41
0.75	0.15	50.75	0.15	10	A10
0.75	0.15	51.1	0.22	8	A8
0.8	0.16	51.25	0.25	13	A13
0.85	0.17	53.4	0.68	1	A1
0.85	0.17	53.55	0.71	31	A31
0.85	0.17	53.55	0.71	33	A33
0.85	0.17	54.25	0.85	43	A43
0.55	0.11	65.45	3.09	46	C17

A comment on the results of grading the vocabulary of the first test image of the achievement scale of the statistics subject in its final form

It is clear from Table (6) that the vocabulary of the first test image of the achievement scale for statistics subject (42) (after deleting the vocabulary that is not appropriate for the foundations of objective measurement) covers the difficulty range appropriately, and it is also noted that there is an appropriate number of vocabulary that covers the different levels over the course of Difficulty connected.

The standard errors of the difficulty estimates ranged between (0.06, 0.17) logite, i.e. (0.3, 0.85) MNF, and the standard error values - these - are relatively small, which indicates the accuracy and stability of the estimates of vocabulary difficulties.

In general, it can be said that the small percentage of the items that are not appropriate for the Rasch model also indicates the good fit of the data to the model, and this in turn proves that these items are homogeneous among themselves, and true in their definition of the variable under measurement.

Figure (3) shows a map of the distribution of the vocabulary of the first test image of the achievement scale of the statistics subject on the measurement continuum.

Conclusions and recommendations
conclusions

- 1- A bank of questions was extracted for the subject of statistics
- 2- Applying the question bank in statistics
- 3- Developing a bank of questions in the subject of statistics in the light of the table of specifications
- 4- The bank includes objective and essay questions, as well as knowledge levels, in the proportions mentioned in the table of specifications.
- 5- A committee to prepare the question bank from those qualified in assessment and exams

Recommendations

- 1- A recommendation to generalize the use of the question bank in statistics and in various courses
- 2- A recommendation to use the question bank in the subject of statistics in preparing test batteries in different capacities
- 3- A recommendation to use the question bank in the subject of statistics in preparing achievement test batteries in basic courses that measure

performance levels at different grade levels.

References

- 1- Unesco (1989):** Final Report of the Regional Symposium on Modern Educational Evaluation Systems and Question Banks in the Arab Region Amman / Jordan
- 2- Sameh Karim:** Fear kills thinking abilities in the high school exam. El-Ahram news papers. (Issue 38188 on 6/28/1991 AD)
- 3- Mahmoud Abu Zaid Ibrahim:** The academic curriculum between dependency and development. (Cairo: Al-Kitab Center for Publishing, first edition 1411 AH - 1991 AD)
- 4- Nadia Jadu (interlocutor):** Dr. Ahmed Gamal El-Din in an interview with Al-Ahram Education. Al-Ahram Education. (Issue 94 on September 24, 2021 AD)
- 5- Salah El-Din Mahmoud Allam:** Models of responding to the test item, one-dimensional and multi-dimensional, and their applications in psychological and educational measurement. (Cairo: Dar Al-Fikr Al-Arabi, first edition 1426 AH - 2021 AD), p. 247 (5). Anzaldua, Ric M.: "Item Banks: what, where, why and How". Paper presented at the Annual Meeting of the Southwest Educational

Research Association (25th, Austin, Tx, February 14 - 16, 2002) .

6- Bode, Rita K. and others: "Issues in the development of an item bank". Archives of physical Medicine an Rehabilitation, volume 84, Supplement2, April 2003, pages 252 - 260.

7- Nuntiyagul, - A torn and others: "Adaptable Learning Assistant for item

Bank Management". Computers and Education. V50 nl p357 - 370 Jan 2008.

8- El- Alfy, -El- Sayed - M & Abdel-Aal,-Radwan-E: "Construction and Analysis of Educational Tests Using Abductive Machine Learning". Computers and Education. v51nl pl-16 Aug 2008.