

TECHNOLOGY OF BUILDING TESTING QUESTIONS AND TASKS IN THE VOCATIONAL TRAINING EDUCATION

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ABSTRACT. This material addresses a significant and current issue related to the construction of test questions and tasks. The essence of basic concepts directly related to the topic of the material are clarified, namely: question, task, test task and others. Some essential requirements for the test questions and tasks, task types, their advantages and disadvantages are considered as well as how they are developed and in which cases they are appropriate to be used. Emphasis is placed on the structured response questions and tasks (closed type). The practice in testology shows that they are of higher quality as compared to the other main group - open-ended response questions (open type).

The material also presents the basic rules for building high quality test questions and selective answer tasks, because these types of questions and tasks are difficult to build, but they are objective, reliable and valid. Specific examples are presented for more clarity and completeness on the application of the different types of test questions and tasks.

Different types of questions and tasks are used in the tests, they are created by specialists in the relevant scientific (subject) field, but their design must be aligned with the current standards in this area in order the measurement and evaluation of specific knowledge, skills and competencies to be objective and reliable.

Keywords: test question, test task

ТЕХНОЛОГИЯ ЗА КОНСТРУИРАНЕ НА ТЕСТОВИ ВЪПРОСИ И ЗАДАЧИ В ОБУЧЕНИЕТО ПО ПРОФЕСИОНАЛНА ПОДГОТОВКА

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РЕЗЮМЕ. В настоящия материал се разглежда един значим и актуален проблем, свързан с технологията на конструиране на тестови въпроси и задачи. В тази връзка се изяснява същността на основни понятия, пряко свързани с темата на разработката, а именно: въпрос, задача, тестова задача и други. Разглеждат се основни изисквания към тестовите въпроси и задачи, видове, техните предимства и недостатъци, как се разработват и при какви случаи са подходящи. Акцентира се върху въпросите и задачите със структуриран отговор (закрит тип). Практиката в тестологията показва, че те са с по-високо качество в сравнение с другата основна група - със свободен отговор (открит тип). В материала са представени и основните правила за високо качество на тестови въпроси и задачи с изборен отговор, защото този тип въпроси и задачи се конструират трудно, но са обективни, надеждни и валидни. Представени са и конкретни примери за по-голяма яснота и пълнота относно приложението на отделните видове тестови въпроси и задачи.

В тестовите се използват различни видове въпроси и задачи, които се конструират от специалисти в съответната научна (предметна) област, но тяхното конструиране трябва да е съобразено с действащите стандарти в тази област, с оглед измерването и оценяването на конкретни знания, умения и компетентности да е обективно и надеждно.

Ключови думи: тестов въпрос, тестова задача

Introduction

The paper aims to show the technology of constructing testing questions and tasks in theoretical and practical aspect.

My practical experience with vocational education teachers for more than thirty years has shown that at present the teachers do not have the necessary theoretical and practical knowledge on the method for construction of test questions and tasks. Nowadays, this issue is very topical, because all the teachers in Bulgaria use tests during the training process, and they prepare tests themselves, which do not correspond to any standards.

Presentation

Each didactical test consists of a series of questions and/or tasks, which are used to check the level of the accumulated knowledge and skills from dedicated training contents

corresponding to the requirements in the educational plans. The questions and the tasks are the basic fundamental element of the didactic tests. The proper selection and definition for the particular test is of great importance for its quality in general (in terms of quality measuring instrument).

1. Basic questions

The paragraph defines the basic questions, which are used while constructing test questions and tasks.

Question: query which requires response (Burov, 1994).

Task: question, a response where is requested by means of mathematical calculations or by cogitation (mathematical task, logical task, etc.); given task or goal, which must be fulfilled (for instance – preparation of a model of a single fundament (Burov, 1994).

Test question – correct, clear, which requires unambiguous response or execution of a certain algorithm of actions.

Distractor – the word originates from English “distract” (confuse, disturb, quell, distract the anger, disorient) (Stoyanova, 1996).

2. Requirements for the test questions and tasks

The selection of questions and tasks doesn't mean that this is a test. It is necessary to fulfil certain requirements in order these questions to be considered as a testing inquiry as follows: to be applied in a system; to be based on concrete goals of the educational process; to match in form and content the age and psychological and physiological specifics of the person tested; to be different in form, structure and language presentation; to fulfil each element from the content point of view of different levels of the educational plan, which will be examined; the definition must be perfect from linguistic, stylistic, content and aesthetic point of view; more than 50% of questions and tasks compared to the planned volume should be defined, because after approbation not all of them will have the quality required and will be dropped or will need to be redefined (Bizhkov, 1992).

3. Classifications of questions and tasks

There is no uniform classification of test questions and tasks, because of various division groups:

- from the point view of their content, they may be divided into questions/tasks on: mathematics, biology, physics, chemistry etc.

- if a cognitive processes must be taken into account – questions and/or tasks on the level of: knowledge, comprehension, application, analysis, synthesis and evaluation.

- c) depending on the level of objectivity (means of evaluation of responses given) of the evaluation – the question or/and tasks are divided into: objective; subjective (Stoyanova, 1996).

One of the most frequently used classifications is related to the way the tested person gives his/her response. The test questions and tasks are divided into two big groups: questions and tasks with open responses (open type); questions and tasks with predefined responses (selection) (closed type) (Bizhkov, 1992).

3.1. Questions and tasks with open response (open type)

The teachers use them more frequently into their pedagogical practice that is why they will be presented first. In this type of questions the tested person constructs the response by himself, which may be presented in various ways: verbally, graphically, etc.

Advantages: quick and easy construction; allow measurement of complex skills and level of development of creative skills.

Disadvantages: difficult evaluation of the performance: the quantitative processing and evaluation of the results is difficult, but in spite of that the qualitative estimation is easier; there is a possibility for subjective evaluation when testing (Stoyanova, 1996).

3.1.1. Types

In testology there are various kinds of questions and tasks of open type. Depending on restrictions to the response of the tested persons, they are of two basic kinds: questions and

tasks with a short response; questions and tasks with an expanded response (Stoyanova, 1996).

3.1.1.1. Questions and tasks with a short response

This type of questions and tasks has a response limited to one or several words, expressions, digits or symbols.

Examples of tasks with a short response:

- Which is the chemical formula of water?
- Bulgaria is a member of EU from (date, month, year).
- When was the Bulgarian state founded?
- Which is Christo Botev's birthplace (as town name)?

They are frequently used and their measurement can be characterised as reliable and valid.

3.1.1.2. Questions and tasks with an expanded response

This group includes: freely made compositions, retelling, essays, etc. The strengths of this type of questions and tasks are that the tested person has the possibility to present his/her own knowledge and skills by himself/herself, to show creativity, to reach more aspects, freely and with arguments to express his/her own opinion, to show ingenuity. The weaknesses can be generally found in the difficulties of the tested persons to express independently with arguments their own thoughts and answers (Bizhkov, 1992).

It is worthy to note the other point of view of F. Stoyanova. She classifies the tasks of the “essay” type into tasks with open expanded response, and also includes tasks for evaluation of the performance skills (musical, artistic, sporting, cooking, technical, etc.). As shortcomings of the tasks with open expanded response compared to these with predefined choice response, the author presents the lower reliability and validity of the measurement. For instance, if the person tested has adopted 50% of all the tasks from the educational plan and he/she by hazard selects a question for which he/she expects good evaluation or the opposite case – expects lower evaluation; in both cases the evaluation doesn't match adequately the total personal knowledge acquired. With the same duration the tested person can resolve a test form, which instead of two questions with open response will contain questions with a selective choice response, covering the whole material of the educational plan (Stoyanova, 1996).

Because of the shortcomings of the questions of open type, their usage should be restricted.

When is it necessary to use questions and tasks with expanded response (open type)?

When:

- there isn't enough time for preparation of tasks with choice response;
- the teacher feels that he/she doesn't have enough knowledge and skills to define other kind of tasks;
- the purpose is to check the capabilities of the person tested to express himself/herself;
- when performance skills or creative capabilities are evaluated;
- the number of tested persons is small and the test is performed for a single use (Stoyanova, 1996).

However they can be used if the following requirements are met: maximum concretisation of the questions and tasks; inclusion of more questions with shorter responses.

The practice shows that the main problem with the questions and tasks with open response is that the evaluation is not objective.

3.2. Questions and tasks with structured, choice response (closed type)

Some questions and tasks have predefined selected number of responses, and the tested persons are requested to show (by means of enclosure, underlying, etc.) the response they think is correct. It is recommended that the correct answer is unique, while the other responses that are given to be the so called distractors (not correct responses). This type of questions and tasks are usually preferable, because they guarantee higher degree of objectivity (Bizhkov, 1992). They allow to be evaluated by specialists, whose area of competency is different from the subject of the test. In various researches it is shown that this type of tasks have higher reliability compared to other types. But it is necessary to know that they are more complex to build, harder to be defined, especially with regard to the distractors. The practice in testing shows that the most effective distractors are built by the tested persons themselves; they are one reliable source of ideas for this type of tasks (Aleksieva, 1994).

With regard to the scope of the higher levels of competence sometimes it is practically impossible to build questions with choice response of higher levels such as: synthesis and evaluation (Stoyanova, 1996).

3.2.1. Structure

That kind of questions and tasks have two main structural elements as follows: condition of the task; list of possible responses.

Considering the higher objectivity of the evaluation it is recommended that all tasks (questions) should contain equal number of distractors and only one correct response (Stoyanova, 1996).

3.2.2. Types

- Identification questions and tasks;
- questions and tasks with alternative response;
- questions and tasks with multiple choice responses;
- questions and tasks for compliance.

3.2.2.1. Identification questions and tasks

T. Ruter shows the following possible cases:

- simple identification (one of the elements of the task is redundant; the tested person is required to cross off, underline, enclose, etc.);
- tasks with multiple identification (for instance, the tested person is required to underly each adjective in a given text);
- tasks for consecutive identification, also called "Labyrinth" (the tested person is required to pass the labyrinth, to reach a given place and to solve the problem in that way).

Tasks which contain a diagram for identification are included into the group of the identification tasks. Typical of them is that they include a diagram, a figure, and the elements, which the tested person must numerate according to the instruction given. There are possible different options for solving the task:

- To present a diagram where all the elements are numerated and the appropriate requirements to the elements of the diagram are given. The tested person is required to point

out the appropriate number from the elements of the diagram before each word in the list.

- A diagram is given whose elements are not numerated, also a list of names of elements with a given number. The tested person is required to numerate the elements of the given diagram.

- A crossing out of improper elements is required, drawing missing elements, connecting of elements according to the instruction given, etc.

3.2.2.2. Questions and tasks with alternative response (from the type "true"/"false"/"yes"/"no")

This type of tasks (questions) represents a list of statements and the person tested is required to define if they are true or false. Each statement has two alternative responses given, one of which is true. The tested person selects one of the two possible responses (Stoyanova, 1996). Questions/tasks of this kind are short, they are created quickly and can cover the greater part of the educational material. Because of that they have wide application when controlling the learning of new educational material.

Advantages:

They are mainly related to the application and the possibilities of this type of tasks (questions):

- they can be used for evaluating knowledge on each cognitive levels;
- they are suitable to distinguish facts among opinions; logical conclusions and ratiocinations; discovering of cause and effect relationships; comprehension and argumentation;
- easy to build;
- the greater quantity of questions and tasks allows to cover better the related educational content, which leads to improvement of the evaluation's validity;
- the direct connection between the test length and its reliability, *ceteris paribus*, the questions and tasks with alternative response permit higher reliability (Stoyanova, 1996).

Disadvantages:

- The possibility of guessing by chance the correct response is usually greater than 50% (it may be compensated with bigger number of tasks (Stoyanova, 1996).
- Triviality of measured knowledge (usually their author is oriented to trivial facts, etc.).

Recommendations for building questions and tasks with alternate response:

- to be constructed in such a way, so that it is clear what is true and what is false, without additional consideration and preconditions (Andreev, 1995)
- the false statements to be more than the true statements;
- key words to be avoided;
- complicated statements to be avoided;
- in false statements to avoid such words as "always", "never"; they may be replaced with "sometime", "usually", "frequently";
- in the true statements "sometimes", "usually", "frequently" must not be used (Stoyanova, 1996).

3.2.2.3. Questions and tasks with multiple choice responses

They are some of the most common in didactical testing in the normative, as well in criteria tests. Each task or question of this type consists of the following structural elements:

- base (a task itself or a question);
- possible responses of a given question (task) (multiple responses, of which only one is true, correct and proper, the others are distractors). Most often the person tested is required to enclose, scratch or underlining the correct response according to his own opinion. It is allowed the task or question to have more than one correct response, but test practice shows that in only one correct response the knowledge and/or the skills are evaluated more properly and objectively.

3.2.3. Basic rules for high quality of questions and tasks with choice response

- To use such a format of the task (question) which has only 1 correct (proper and full) response.
- Short formulation of tasks (questions).
- To be independent from one another.
- To avoid negative phrases and negative conclusions.
- To use a question form (direct question) and not to use unfinished sentences.
- To avoid trivial tasks (questions).
- The responses to follow logical consequence (chronological order of the events).
- The responses to be of the same length (homogeneity).
- The position of the correct response to follow the random principle;
- Key words must be avoided.
- To use attractive distractors (for instance – typical errors of students, scientific terminology).
- Do not use distractors such as “none”, “all cited”, etc., which are not effective.
- To be elaborated in such a visual way, which is easily perceived and readable (Bizhkov, 1994), (Stoyanova, 1996).

All of the above-mentioned rules can be broken only if there are enough reasons for that.

The positive sides of the questions and tasks with multiple structured response are more as compared to the negative ones, namely:

- knowledge at almost all levels is evaluated;
- they are independent of external factors such as: orthography, handwriting, psychological condition, etc.;
- the check is fast and may be performed by unqualified persons, also automatically;
- the evaluation is maximally objective;
- it may fully cover the educational content and achieve the objectives of the evaluation.

The negative sides/difficulties when building questions/tasks with multiple structured responses are as follows:

- they need relevant level of knowledge and training of the teacher for the construction of tasks (questions);
- more time is needed for their creation;
- there is some risk of guessing by hazard the correct answer, but this may be reduced by using more attractive and effective distractors.

For instance:

Enclose the right answer of the statement:

Ottawa is a capital of: a) USA; b) Japan; c) Canada; d) China.

3.3. Questions and tasks for compliance

This type of questions and tasks is another form of the group with choice response and because of that they will be defined in a dedicated paragraph. The basic rules of that group (Bizhkov, 1992).

The main thing is that the preliminary information (the base) of the question and/or the task is presented in at least two columns. The person tested is required to relate the elements of one column to the elements of the other (Bizhkov, 1992).

3.3.1. Structure

Each task or question contains a condition and two columns (in most cases) with words, digits, symbols, statements. For each element from the first column, the tested person is required to define the corresponding element from the second column. It is not recommended to include items (existing standalone) in one column that do not have match items from the other column. The list of multitudes between which compliance can be established is infinite, but most often the following are used: events-dates; concepts – definitions; terms – indications; tools-application; persons – products of the activity; words (idioms) – translation; actions – results; elements – functions; principles – examples. (Stoyanova, 1996).

3.3.2. Quality requirements for questions and tasks for compliance

When building tasks or compliance questions, it is necessary to comply with rules specific to this type, which ensure their high quality to a great extent.

- The content of each column to be homogeneous (it is aimed at a higher discriminatory force, i.e. to distinguish strong from weak pupils).
- The elements in the columns to be arranged in optimal order (alphabetical, descending, ascending, etc.)
- It is recommended that the two columns have different lengths (as in the example; left column has more elements than the right column) (Stoyanova, 1996).

Positive sides

- They allow relatively quick and easy check of the level of learning of a large amount of factual information.
- The assessment is objective and does not depend on the person who makes the verification.
- The verification may be carried out by an unqualified person or automatically.
- Stimulate the testing persons to integrate (summarise) the knowledge and skills (Bizhkov, 1992).

Negative sides/difficulties

- It takes considerable time to construct this type of questions and tasks.
- A longer list of possible answers makes it difficult for the tested persons to perceive them.
- Higher cognitive levels cannot be checked such as: analysis, synthesis, assessment (Bizhkov, 1992).

Task 1. Join with arrows the elements of the left column which correspond to these of the right column:

Building	
Pen	
Monkey	Animal
Horse	Construction
Pencil	Notebook

Task 2. Join with arrows the elements of the left column which correspond to these of the right column:

Action	Result
36/6	7
10/2	4
20/5	6
45/5	5
56/8	9

Table 1 presents the main advantages and disadvantages of tasks of open and closed type.

Table 1. Advantages and disadvantages of the questions and tasks from the two main groups (open and closed type)

N	Preliminary conditions	Tasks with a choice response	Tasks with an open response
1	Time for defining a task	More time (-)	Less time (+)
2	Time for checking the test	Less time (+)	More time (-)
3	Time for checking the results	Less time (+)	More time (-)
4	Objectivity of the evaluation	Higher (+)	Lower (-)
5	Reliability of evaluation	Higher (+)	Lower (-)
6	Degree of professionalism	Higher (+)	Lower (-)
7	Possibility of random selecting the correct answer	Higher (-)	Lower (+)

It should be noted that none of the different types of tasks should be absolutized. Everything depends on the specific situation, the conditions, circumstances, objectives, educational content, degree of professionalism, etc.

3.4. Half-opened Questions and Tasks

There is another group of questions and tasks, which also has its application as elements of didactical test. They are called half-opened questions and tasks and the following two

types of questions/tasks will be presented: for addition; for replacing.

3.4.1. Questions/tasks for Addition

This is one of the oldest forms and its advantage is primarily that the random selection of the response is reduced to the minimum. However, this is also a shortcoming. On one hand, the positive side is that the tested person can present the knowledge learned by himself. But there is a difficulty in quantitative estimation. There is need to point out the fact that for resolving such kind of tasks/responses more time for deliberating is needed. Because of the subjectivity of the task/question formulation, it is not possible to guarantee higher degree of objectivity of the results.

- The question/task consists of missing words, digits, figures, etc.
- The tested person is required to fill in what has been omitted.

3.4.2. Questions/tasks for replacement

Wrong information is given in them and the tested person is required to replace it with the correct one (e.g.: find out the wrongly included digit, sign, etc.; chemical compound, formula for naming, etc. and replace it with the correct one) (Bizhkov, 1992).

Conclusion

In the construction of questions and tasks for the verification of given knowledge and skills by means of test, various types can be used, as the specialists who develop them must comply with the acting standards for their construction.

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