A New Approach to Multiple-Choice Question Writing: Example, Transparency, and Variation

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Summary:
The goal of the present article is to provide the teacher with an alternative perspective in writing multiple-choice questions. To the techniques and advice available in the literature on the topic, three further aspects are added whose provenance is an emerging line of research – the exemplification of concepts. The objective is to expand multiple-choice questions from their present almost exclusive function of evaluation, and turn them also into a useful instrument for everyday classroom work.

Keywords: multiple-choice questions; concept exemplification.

Resumen:
Este artículo tiene como objetivo proporcionar al profesor otra perspectiva en la elaboración de cuestiones de elección múltiple. A todas las técnicas y consejos disponibles en la bibliografía específica se añadieron tres aspectos oriundos de una línea de investigación emergente, la ejemplificación de conceptos. Nuestro objetivo es retirar a las cuestiones de elección múltiple la casi exclusiva función de evaluación, haciendo que sean, además, un instrumento útil en el trabajo cotidiano.

Palabras clave: Cuestiones de Elección Múltiple; Ejemplificación de Conceptos

Résumé:
Cet article est destiné à procurer au professeur une autre perspectif dans l’élaboration de questions à choix multiples. A toutes les techniques et conseils disponibles dans la bibliographie spécifique nous avons voulu rajouter trois aspects issus d'une ligne d'investigation émergente, l'exemplification de concepts (illustration à l'aide d’exemples). Notre objectif est de retirer aux questionnaires à choix multiples leur fonction presque exclusive d'évaluation, tout en les
transformant en un instrument de travail quotidien et utile.

**Mots clés:** Questions à Choix Multiples; Exemplification de Concepts

**Introduction**

Teachers, and especially mathematics teachers, frequently have recourse to using multiple-choice questions (Kehoe, 1995). Even though we all make use of some basic set of guidelines, it is still not easy to write this type of question if we want them to genuinely fulfil our intention (Kehoe, 1995; Frary, 1995; Haladyna, Downing & Rodríguez, 2002). Writing examinations with items of this nature is strongly oriented to the evaluation of knowledge or learning. Often these evaluations are set by a teacher, but there are others implemented by the State itself. The quality of these examinations depends in the first instance on the quality of each item. Hence, one of the most important steps is writing this type of item (Haladyna & Downing, 1989a). But the use of multiple-choice questions is not exclusive to evaluation, although that is clearly its commonest area of application. They may also be used in formative assessment situations or even in everyday class work. As will be seen below, this kind of question, if constructed observing certain key aspects, has a set of characteristics that show themselves to be important in teaching mathematics.

The aim of the present work is to present another perspective for writing multiple-choice questions and to expand the scope of their use. The approach will be based on the interpretation of exemplification, starting out from the notions of variation and of transparency of an example with respect to a concept, which will be applied to transparent multiple-choice questions.

Thus, an analysis will be made of the twofold use that is made of multiple-choice questions as a tool in everyday teaching activities and not just exclusively as an element of tests of evaluation.

1. **Multiple-Choice Questions in the Literature**

Before proceeding, we shall establish the terms commonly used in the literature on multiple-choice questions. The 'stem' is the introductory question or incomplete statement at the beginning of each item. It is followed by the 'options'. The options consist of the 'key' (the correct option) and 'distractors' which, although incorrect, are (it is hoped) tempting (Kehoe, 1995).

Numerous sets of guidelines for the quality construction of multiple-choice questions have been published and are readily available in different specialist journals (see for example, Adams, 1992; Haladyna & Downing, 1989a; Sireci, Wiley & Keller, 1998). Haladyna and Downing, (1989a,b) reviewed 96 theoretical and empirical studies in which they identified 46 such guidelines. They found that many of them had no theoretical base in any previous work, and therefore suggested that there was a need for a study based on empirical or statistical data. Subsequently, Haladyna,
Downing and Rodríguez (2002) proposed a new list of 31 guidelines for good multiple-choice question writing.

Many adults have at some time during their life responded to multiple-choice situations (Vacc, Loesch & Lubik, 2001) – in school, job seeking, professional training, college, etc. Multiple-choice questions are widely used and have a significant impact on the lives of the people who have to answer them. This is the reason why the use of proven and effective techniques for their construction is so important (Vacc, Loesch & Lubik, 2001; Haladyna, Downing & Rodríguez, 2002).

The popularity of these tests is the result of their various attractive characteristics. They can be marked quickly, they are relatively precise, economic, and objective, and they can be applied to a great variety of topics (Cohen & Swerdlik, 1999). Also, they can be targeted at different levels: according to Vacc, Loesch and Lubik (2001), multiple-choice questions can evaluate different cognitive functions – memorization, application, and analysis.

With respect to the guidelines put forward by different researchers, while there is agreement on many, there are others that are not universally accepted. Since the goal of the present work is not exhaustivity on this point, a restriction will be made to noting only some of those about which there is full agreement in the literature, following Haladyna, Downing and Rodríguez, (2002):

Guidelines for multiple-choice question writing

<table>
<thead>
<tr>
<th>Writing stems:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Use clear, simple language.</td>
</tr>
<tr>
<td>2. Present a single idea or problem.</td>
</tr>
<tr>
<td>3. Include most of the words and as much information as possible so as to avoid long options.</td>
</tr>
<tr>
<td>4. Avoid expressions in the negative.</td>
</tr>
<tr>
<td>5. Avoid stereotyped phrases.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Writing options:</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Take care to avoid including irrelevant information.</td>
</tr>
<tr>
<td>7. The options must be mutually independent.</td>
</tr>
<tr>
<td>8. Avoid the use of &quot;all of the above&quot; and take great care with the use of &quot;none of the above&quot;.</td>
</tr>
<tr>
<td>9. The distractors must be appealing to those students who have not mastered the content given in the stem.</td>
</tr>
<tr>
<td>10. Good distractors are comparable in length, complexity, and grammatical form to the key.</td>
</tr>
<tr>
<td>11. Avoid distractors that contradict each other.</td>
</tr>
<tr>
<td>12. Avoid providing cues that point to the key.</td>
</tr>
</tbody>
</table>
The overwhelming use of multiple-choice questions is for evaluation. All of the literature that we have consulted points to that (almost) exclusive use – i.e. as items of a test. In textbooks, however, their use is also presented as an exercise. In the present article, different situations will be considered which are suited to the use of multiple-choice questions, particularly in classwork and in formative assessments.

2. The Example

It has long been recognized that students learn mathematics more by contact with examples than through formal definitions. It is with examples that the definitions take on meaning (Watson & Mason, 2002).

Consider the following infinite sequences of numbers:

<table>
<thead>
<tr>
<th>A</th>
<th>2, 4, 6, 8, 10,…</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>1, 4, 7, 10, 13, 13, 13, 13, 13,…</td>
</tr>
<tr>
<td>C</td>
<td>√5, 2√5, 3√5, 4√5, 5√5, 5√5,…</td>
</tr>
<tr>
<td>D</td>
<td>-2, -2, -2, -2, -2,…</td>
</tr>
</tbody>
</table>

One could take each of these sequences to be an example, but one could also take all of them together to be a single example consisting of four sequences. Let us suppose that one of the following texts is presented before the presentation of the sequences:

<table>
<thead>
<tr>
<th>E1.</th>
<th>After analyzing the four sequences A, B, C, and D, indicate what for you they have in common.</th>
</tr>
</thead>
<tbody>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>E2.</td>
<td>For each of the following arithmetic progressions, indicate the value of its common difference.</td>
</tr>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>E3.</td>
<td>There exist arithmetic progressions whose common difference is not rational. Indicate an example of that in one of the following progressions:</td>
</tr>
</tbody>
</table>

Thus the same situation – an example consisting of four sequences – has three very different uses. The first is a case of a particularization that presents a basis for a generality. The aim is for the students to generalize a characteristic that is common to four elements in order to construct a definition of Arithmetic Progression. This example thus materializes a concept, i.e., it in some form
personifies the characteristic that is general and generalizable. The example would have an inductive use (Rowland & Zaslavsky, 2005). If one wanted, one could have opted for the opposite sense: first introducing the definition of Arithmetic Progression to see immediately the different materializations of the concept thus defined. The example would then have a deductive use (Rowland, Thwaites, & Huckstep, 2003).

In the second, the example could serve as an illustration or as a practical activity, aimed at the student developing skill in a given process or technique (Sangwin, 2004). Being an activity that is based on calculating differences, the aim might seem only to be to check that indeed these are four arithmetic progressions. But clearly the intention may also be for the pupils to make contact with different kinds of progression.

The third could easily be one of a set of items constituting an examination. With a question like this, the teacher's intention is only to determine whether the pupil knows how to distinguish between rational and irrational terms in the field of progressions. I.e., it is a question designed to indicate whether the pupil knows how to give a correct response concerning a particular topic.

### 2.1. Three distinctions and three characteristics

For this article, we propose a classification into the categories obtained from the three situations in E1–3 above. Depending on the purpose for which it is used, the same example can be:

- A particularization (obtained from E1) if it is presented on the one hand after a definition in order to embody that definition in a deductive process, or on the other before the definition as part of an inductive process. Both processes, however, are aimed at the generalization of the concept being defined.
- A problem or an exercise (obtained from E2) according to whether it is oriented to practice or to the development of skill in some technique or process (Watson & Mason, 2002).
- One item (obtained from E3) of a series of items which together constitute an instance of evaluation.
For Bills et al. (2006, p. 135), independently of what distinctions and classifications might be made of examples, there is one characteristic that they all ought to have – utility. An example is useful if it is transparent and generalizing:

- Transparency, making it relatively easy to direct the attention of the target audience to the features that make it exemplary. This notion will be returned to below in Section 4.1.
- Generalizability, the scope for generalisation afforded by the example or set of examples, in terms of what is necessary to be an example, and what is arbitrary and changeable.

For those authors, the teacher's role is to present favourable circumstances for learning that involve a great variety of "useful examples" (without overwhelming the learner which could instead lead to confusion) targeted at the students' needs and characteristics.

2.2. *Examples, non-examples, and counter-examples*  

An example is to be understood as a general situation referring to a concept or a definition. Some authors classify examples by their nature (Bills et al., 2006), others by their use, function, or objective (Rissland-Michener, 1978; Figueiredo, 2005; Figueiredo, Blanco & Contreras, 2006). In the following some cases involving three themes of secondary education mathematics are presented in order to illustrate and add meaning to the content of the study. Clearly, of course, one can find similar situations in most of the content of the different levels of mathematics teaching.

Hence, from the following definition
**Definition 1:** A Sequence of Real Numbers is any application of \( \mathbb{N} \) in \( \mathbb{R} \).

We could present the examples

**Examples:** \( a_n = 3n^2 + 2 \); \( b_n = \frac{1}{2n+1} \); \( c_n = \sqrt{n + \frac{1}{n}} \)

A non-example serves to define the limits of a concept, or of a case in which a procedure is not applied or fails to give the desired result, or to demonstrate that the conditions of a theorem are precise and well defined (Bills et al., 2006). They are cases that, while close to the example, are not themselves examples because they violate some rule inherent in the definition.

Thus, with respect to **Definition 1**, one has the non-example

**Non-example:** \( e_n = \frac{1}{2n-10} \)

which is not a sequence because the term is not defined for \( n = 5 \).

Now let us consider another definition:

**Definition 2:** A term of the sequence \( a_n = \frac{n}{n+1} \) is any real number that it is obtained from specifying a value of \( n \) in the general term \( a_n \).

In this case, one could present the non-example

**Non-example:** \( \frac{\sqrt{5}}{\sqrt{5} + 1} \)

because the value given to \( n \) was not a natural number, as required in **Definition 1**.

Counter-examples are familiar to us all as being used to demonstrate that certain arguments or statements are false. They are used to bring out the differences between concepts or to define their limits well (Rissland-Michener, 1978; Zaslavsky & Ron, 1998).

These cases are examples because they are mathematical objects that satisfy all the initial characteristics present in the statement, but they do not have the additional characteristic or characteristics that the statement attributes to them.
Take the following (false) statement in Plane Geometry:

**Statement**: Every quadrilateral with perpendicular and equal length diagonals is a square.

**Counter-example:**

This argument is a mathematical object which, while verifying the characteristics present in the antecedent, does not necessarily have the characteristics ascribed to it by the consequent. This is also the case of the following (false) argument:

**Argument**: Since 18, 36, and 72 are both multiples of 9 and multiples of 6, then all multiples of 9 are also multiples of 6.

**Counter-example**: 27.

### 3. Dimensions of Possible Variation and Range of Permissible Change

People's attention is naturally drawn to noticing variations in an otherwise invariant context. It is intuitive to conclude therefore that students will not understand some important aspects of the material presented to them or given them as exercises to work on if there is little or no variation present. If the students are going to experience variation and, moreover, to learn from it, then there must be variation at a sufficient rate for it to come to their attention (Mason & Watson, 2005).

Marton and Booth (1997) developed the notion of learning as discernment, i.e., the recognition that one only becomes aware of something when there exists variation (where nothing varies, no distinction is possible). Thus:

- To learn is to understand the possible variations that we had not been aware of previously (Mason & Watson, 2005).

**Dimensions of Possible Variation**: In order to appreciate a concept in mathematics, it is essential
to be at least subliminally aware of what is exemplary about a given example – what aspects, what dimensions can change and still the example remain an example of the concept (Mason & Watson, 2005).

**Range of Permissible Change:** Hand in hand with each dimension of possible variation there is the range of its permissible change. The *Permissible Amplitudes of Change* must reflect any limitations on the nature and extent of the changes that are permitted. In identifying the dimensions of possible variation which make a concept what it is, it is important to remember that one of the reasons for using the words *possible* and *permissible* is to draw attention to the fact that there may be significant differences between students and teachers in the scope of what they are aware of, and this may in turn differ from mathematical convention or canon (Mason & Watson, 2005).

The awareness of a dimension of possible variation is essentially awareness (perception) of generality. Put another way, awareness of the dimension of possible variation is essential for people's example spaces to be richly representative of concepts. Learning a concept in mathematics requires awareness of what aspects, features, relationships, or properties are invariant while at the same time other major features or aspects are allowed to vary (Mason, 2005).

Since it is unreasonable to expect every student to reconstruct every possible dimension of variation for themselves, even with the assistance of carefully written, schematically constructed exercises, it is of major advantage to learners if their teachers are themselves aware of the various dimensions of possible variation (Mason & Watson, 2005).

The use of examples in the classroom is an essential, and always complex, field. It involves careful selection of specific examples to facilitate attracting the students' attention appropriately, as well as explaining and inducing generalizations (Bills et al., 2006).

### 4. A Different Approach to Multiple-Choice Question Writing

Accepting that evaluation is the aspect most extensively dealt with in the literature on multiple-choice questions, we shall now consider in greater depth their introduction into the teaching-learning context by using techniques of exemplification.
The exemplification provided to the students must be rich and varied (Bills et al., 2006). But it must be presented as a series of examples (Mason & Watson, 2005; Sangwin, 2004) which either offer variation that is perceptible to students (Bills et al., 2006) and allows them to extend their personal example spaces (Watson & Mason, 2002; Bills et al., 2006), or maintain an invariance that allows them to induce a generality (Watson & Mason, 2002; Mason, 2005; Bills et al., 2006).

It is in this regard that the multiple-choice example is particularly well-suited since its set of options contain both the variation and the invariance. Thus, the student has the opportunity to form the structure of the concept being studied, whether by abstraction or by defining its boundaries. To learn is to extend example spaces – to add examples to those that are already well known so that concepts can be reconstructed and restructured (Watson & Mason, 2002; Bills et al., 2006). This can easily be done in a multiple-choice context in which each item has 3, 4, or more options (answers). Each option must correspond to a dimension of possible variation, and the logical value of the statement contained in the key (the correct answer) must lie within the bounds of the range of permissible change – going outside that range generates non-examples or wrong answers. The non-examples, by staying close to the example and thus appearing plausible, give a false idea of veracity, as recommended in Guideline No. 9 (Section 1).

If the stem of the multiple-choice item is in the form of a statement, each rejection of some distractor may involve the use of a counter-example, or perhaps the identification of a non-example. But only those students who have developed a correct structure of the concept will manage to do
4.1. Transparent examples

As was seen in Section 2.1, an example is transparent if it allows the student to see its essential aspects that make it a paradigm of a concept.

The transparency of an example may be at the base of what Mason and Pimm (1984) call a Generic Example or Rissland-Michener (1978) call a Reference Example. They are examples which the teacher considers to be paradigms of a certain concept, i.e., general cases that represent an entire class of examples which have the same purpose – to illustrate a given concept.

Let us consider the expression \( f(x) = a(x-h)^2 + k \) which is a way of representing a second-order polynomial function (if \( a \neq 0 \)) whose graph is a parabola. We can obtain \( f(x) \) by applying the three transformations of the plane to \( g(x) = x^2 \), and, if the vertex of the parabola defined by \( g(x) \) has the coordinates \( V(0,0) \), then the vertex of \( f(x) \) is the point of coordinates \( V(h,k) \). Assuming that the student understood the steps indicated, then the expression \( f(x) = a(x-h)^2 + k \) is a generality that admits the particularization \( h(x) = (x-2)^2 - \sqrt{5} \) whose associated parabola has its vertex at the point of coordinates \( V(2, \sqrt{5}) \). Observe that the example is transparent with respect to the concept of the graph of a parabola of known vertex.

The programs of Mathematics-A in Portugal (years 10–12 of schooling) include many expressions that are transparent with respect to certain concepts:

- \( (x-1)^2 + (y-5)^2 = 6^2 \) is transparent with respect to the coordinates of the centre and the radius of the circumference that it defines, but \( x^2 + y^2 + 4x + 2y - 6 = 0 \) is not.
- \( f(x) = \frac{x-1}{x^2-4} \) is transparent with respect to its horizontal asymptote because, having studied the limits of real functions of a real variable, the students see that the degree of the numerator is less than that of the denominator, and know that in such cases the limits at \( \pm \infty \) are zero, and hence that \( y = 0 \) is the function's horizontal asymptote.
- \( |z-i| \leq |z-(2+i)| \) is transparent with respect to the closed semiplane that includes \( i \) and is bounded by the straight line that is the mediatrix of the straight-line segment \( [i; 2+i] \) in an Argand diagram.

The characteristics of transparent examples do not by themselves provide the results we want. The principal outlines, subtleties, and limits, and the connections between them will not be constructed
by the student by our simply presenting him or her with transparent examples. For instance, the two sides who are the actors in the teaching-learning process do not interpret the examples in the same way. For the teacher, a certain example may play the role of a paradigm while, for the student, it is just another case to learn (Mason & Pimm, 1984). It is the teacher's job to be on the lookout for this difference in perspective so as to empower the use of examples, and to make it clear why they are important and what their function is supposed to be. In other words, the features of this type of example that make them paradigms from the teacher's perspective can pass completely unnoticed for the students. If this is the case, the goal of the planned presentation would be totally missed, and the student would get no benefit at all from the fundamental purpose of the example that the teacher presented. How and to what degree an example may be transparent is very subjective (Bills et al., 2006). The class atmosphere, the content, and how the teacher presents the examples and their most outstanding characteristics, can make the difference between an example that is well understood and useful and one that is just another example.

4.2. Dimensions of possible variation, range of permissible change, non-examples, and counter-examples

Consider again the example \( f(x) = a(x-h)^2 + k \). Observe that the letters \( a, h, k \) refer, respectively, to the sense of its convexity and the possible contraction or expansion of the graph, to a horizontal translation, and to a vertical translation. These three letters indicate the three dimensions of possible variation in this example, and the ranges of permissible change are \( \mathbb{R} \) in the case of \( h \) and \( k \), but \( \mathbb{R}\backslash\{0\} \) in the case of \( a \). In the case of \( a=0 \), we would be in the presence of a non-example.

Now let us again consider Definition 1 (Section 2.2): A Sequence of Real Numbers is any application of \( \mathbb{N} \) in \( \mathbb{R} \). As was seen above, \( u_n = \frac{n}{n+1} \) is a particularization of this concept, but \( v_n = \frac{n}{n-5} \) is a non-example because the term is not defined for \( n = 5 \). Observe that in this case the dimension of variation does not correspond to a numerical element of the expression, but to an operational element. The range of permissible change does not include all four basic operations. If the use of the operation "-" gave rise to a non-example, the use of the operations "+", "\times", and "÷" would give rise to another three particularities.

In the example of a rational function \( f(x) = \frac{x-1}{x^2 + a} \), one is introducing a dimension of possible variation when with the parameter \( a \). The range of permissible change is the entire set of real numbers. But if this example \( f(x) = \frac{x-1}{x^2 + a} \) were presented to illustrate the existence of vertical asymptotes, the parameter \( a \) would continue to be one of the dimensions of possible variation, the
range of permissible change would only be the negative real numbers for the existence of two vertical asymptotes, and the variation would be reduced to a single value, zero, for the existence of only one vertical asymptote.

Suppose that one states that for all $a$ in $\mathbb{R}$ there exist vertical asymptotes for $f(x) = \frac{x-1}{x^2 + a}$, using this example because of its transparency with respect to this concept. Then the value $a=3$ would constitute a counter-example, since $x^2 + 3$ has no real roots.

It is thus clear how adaptable the "multiple-choice" genre is when the aim is to explore the transparency, the dimensions of possible variation, the range of permissible change, and the non-examples and counter-examples of appropriate options for the concept indicated in the stem of the item.

**STEM OF THE ITEM:**

<table>
<thead>
<tr>
<th>OPTIONS:</th>
<th>TRANSPARENT EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>1st <strong>DIMENSION OF VARIATION</strong> or 1st <strong>NON-EXAMPLE</strong></td>
</tr>
<tr>
<td>2nd</td>
<td>2nd <strong>DIMENSION OF VARIATION</strong> or 2nd <strong>NON-EXAMPLE</strong></td>
</tr>
<tr>
<td>3rd</td>
<td>3rd <strong>DIMENSION OF VARIATION</strong> or 3rd <strong>NON-EXAMPLE</strong></td>
</tr>
<tr>
<td>4th</td>
<td>4th <strong>DIMENSION OF VARIATION</strong> or 4th <strong>NON-EXAMPLE</strong></td>
</tr>
</tbody>
</table>

N.B. One of the options would have to be the key, and the other three, distractors.

**4.3. A practical case**

It would make no sense to write the present work without including a multiple-choice item that follows the guidelines presented in Section 1 and the suggestions put forward in the subsequent sections.

The following multiple-choice item might serve as an exercise or as a test item:

"""Consider the graphs of the functions $f$ and $g$ below."""
If the function $h$ is defined by $h = \frac{f}{g}$, one can affirm that:

A. The roots of $h$ are $x=0$ and $x=4$.
B. The sign of $h$ is positive in $]-2,0[$.
C. The domain of $h$ is $\mathbb{R}\setminus\{0,4\}$.
D. $\lim_{x\to 0^+} h(x) = -\infty$.

A check of this multiple-choice question against the guidelines presented in Section 1 shows that it satisfies each of the twelve points.

With respect to the dimensions of possible variation and the respective ranges of permissible change, one first observes that each option includes a different dimension. Given the form in which the function $h$ is presented, the question is transparent with respect to the concepts of root, sign, domain, and limit at a point. The ranges of permissible change are easily identifiable. In the first dimension, the range is $\mathbb{R}$, but the use of any value other than -2 and 2 will generate counterexamples with respect to the roots of $h$. In the second dimension, the range is manifest in the form of intervals; in the third, it is in terms of the zeros of the denominator; and, in the fourth, in the form of the signs used in the quotient.

5. When the Stem is Not Transparent with Respect to the Options

Consider an instance of one of the previous examples: $f(x) = 3(x-2)^2 + 1$. If the stem of the exercise or item asks which are the coordinates of the vertex, then the student who has mastered this topic will have no difficulty in replying immediately and correctly. But if we used the example $f(x) = x^2 + 4x - 6$ in this exercise or item, even the students who would have had no problem in
responding to the previous situation would no longer be able to reply immediately. Possibly, the reason is the second example's non-transparency with respect to the coordinates of the vertex. The students will need to have recourse to calculation or a graphical calculator to answer. Perhaps they need to have or to develop that skill, but to evaluate or practise it a multiple-choice example might not be the most advisable. This suggestion is possibly extendable to proofs and problem solving.

While in the specific case of mathematics, calculation, problem solving, and mathematical proof are areas in which exemplification in the form of multiple-choice may not be the most appropriate, we are convinced that multiple-choice examples are well suited to use in situations where answers are immediate, with no calculation or written output.

6. In Synthesis

From the perspective of evaluation, there is ample literature on multiple-choice tests. Nevertheless, the process of teaching-learning on the basis of the use of transparent examples with an appreciable variation, in which the dimensions of possible variation are worked on with a view to extending the learners' personal example spaces is an emerging topic.

The intention with this work has been to bring everything together in the concept of a transparent multiple-choice item, a perspective from which it will be possible to give a new slant to constructing this type of example. We believe that the concept of transparent multiple-choice item may constitute an interesting and useful guideline for a teacher to follow in writing multiple-choice items, whether they are to be used as test questions or as exercises and particularizations of the concepts being taught. In everyday teaching activities, the role of this instrument has been almost exclusively oriented to evaluation. In our judgement, it is possible to also transfer its use to the everyday teaching-learning context, and hence give it this twofold functionality of sometimes being used as a particularization or as exercises, and at other times being used as an evaluation tool.

References


of Stellenbosch, 4, 225-232.