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The role of feedback in decision making learning in Psychology: critical thinking and flexibility

El papel de la retroalimentación en la formación para la toma de decisiones en Psicología: pensamiento crítico y flexibilidad

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Abstract

Higher education aim is to give students skills for flexible and critical decision making in the face of changing situations and contexts. To foster them, we use the Strategic Analysis for Scientific Texts Model, (SAStxt), an instructional tool that provides them with problem solving skills and guides them to identify and comprehend conventional components of texts. Specific feedback to SAStxt performance has proven effective in helping students improve their skills, but it implies high costs in time and effort. As an alternative, generic feedback was designed, based on the structure of the expected responses. Its effectiveness over the performance of 11 advanced students of Psychology major was assessed. To that aim, a curricular course incorporated a baseline assessment and 5 exercises with SAStxt. Students either received specific feedback first and then the generic one, or in reverse order. The mean scores on each exercise and the proportion of correct responses as a function of type of feedback were analyzed. Data suggest that generic and specific feedback have equivalent effectiveness at least with advanced students. This contribution may diminish obstacles university teachers find in giving feedback to massive classes on their critical skills.

Feedback, Strategic text analysis, Methodological and Conceptual skills

Resumen

La educación superior debe formar habilidades para tomar decisiones frente a situaciones y contextos cambiantes con flexibilidad y perspectiva crítica. Para ello, contamos con el Modelo de Análisis Estratégico de textos (MAEtxt), herramienta instruccional que guía la identificación y comprensión de componentes convencionales de textos, así como el planteamiento y solución de problemas. La retroalimentación específica al desempeño en el MAEtxt había sido altamente efectiva para promover mejoras, pero es costosa en tiempo y esfuerzo. Como alternativa, se diseñó una retroalimentación genérica basada en la estructura de la respuesta esperada y se evaluó su efecto sobre el desempeño de un grupo de 11 estudiantes avanzados de licenciatura en Psicología. En un curso curricular, se incorporaron una evaluación diagnóstica y 5 ejercicios con el MAEtxt. La mitad del grupo recibió primero retroalimentación específica y luego genérica, mientras la otra mitad las recibía en orden inverso. Se analizó el puntaje promedio en cada análisis y la proporción de respuestas correctas frente a cada tipo de retroalimentación. Los datos sugieren que específica y genérica son equivalentes en efectividad, al menos con estudiantes avanzados. Esta contribución permitirá disminuir las dificultades de los docentes para retroalimentar la ejecución de habilidades críticas en aulas masivas universitarias.

Retroalimentación, Análisis estratégico de textos, Habilidades metodológicas y Conceptuales

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Introduction

Critical thinking has been pointed out as a very relevant formative objective at various educational levels, since its relevance for autonomous, responsible and information-based decision making is assumed. It is considered a desirable element and one that brings great advantages for performance in academic contexts (Huicochea & Rubio, 2018), in corporate and employment environments (D2L, 2019), for citizen participation (Freixa i Baqué, 2011) and even for environmental conservation and global sustainability (Vendrell & Rodríguez, 2020). This is why it is included in international recommendations for higher education (UNESCO, 2009; WEF, 2015; 2016).

At the higher level, most educational institutions mention among their purposes to train their students in critical skills, but it is often unclear how they define them and how they propose to materialize those objectives (Ellerton, 2015; Picón & Peñaloza, 2022; Vendrell & Rodríguez, 2020). A useful proposal is to define it in terms of skills, as do Michael Scriven and Richard Paul (2003), who call critical thinking the process of conceptualizing, analyzing, synthesizing, applying and/or evaluating information gathered through observation, experience, reasoning, feedback or communication. A complementary and more detailed approach is that of Levy (1997), who defines it as the ability to recognize the difference between facts and theories, making one's own decisions based on factual accuracy and logical consistency. The author describes that this requires the ability to objectively collect, weigh and synthesize information and make reasonable inferences, judgments and conclusions, identify and question underlying assumptions and beliefs, discern hidden or implicit values, perceive similarities and differences between phenomena, understand causal relationships, reduce logical problems and personal biases, avoid over-simplifications and over-generalizations, explore alternative perspectives and seek creative solutions. All this under an attitude of tolerance to uncertainty and ambiguity, so it is also recognized that it includes a component of socioemotional skills (Luna, 2022).

In the context of specific training in Psychology, and in harmony with international (APA, 2013), national (LGES, 2021) and institutional (Faculty of Psychology, 2008) standards, work has been done for three decades on the definition, teaching and development of professional skills that allow students to examine, evaluate and understand events, solve problems, and make decisions based on sound reasoning and valid evidence, consolidating what has been named the Methodological and Conceptual Skills Model or HMC (Santoyo, 2021). This model, its implications and instructional tools such as the Model of Strategic Text Analysis (MAEtxt), are closely related to the definition of critical thinking skills previously mentioned, since it highlights the importance of students being able not only to paraphrase information and replicate procedures, but also to critically evaluate the information received, identify their basic assumptions, evaluate the internal and external validity of their own and others' arguments and conclusions, and be able to propose alternative courses of action. To this end, it recognizes the need to generate learning situations that induce them to identify and solve problems through actions such as deducing, relating, evaluating and creating, at all educational levels (Capcha & Tipula, 2022; Mejías, 2022; Quispe, 2022; Santoyo & Colmenares, 2016). All this, under the conviction that training in skills of this type, transversal to disciplinary content and applicable in different contexts, contributes to the cognitive flexibility of students (Ionescu, 2012), to their ability to generate creative solutions to various problems, and to their competence to adjust to the changing challenges posed by academic life (Kercood, Lineweaver, Frank & Fromm, 2017) and that will later be demanded by working life (Nägele & Stalder, 2017).

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In the educational context, typically, efforts have been made to assess critical thinking through instruments (López, Martínez & Sierra, 2017; Ossa-Cornejo et al, 2017), in which the perception about one's own skills is evaluated, or in the best case, hypothetical situations are presented in which one can respond by exercising the skills. However, these efforts are usually outside the real context of the tasks and content to be covered curricularly, and therefore have low ecological validity. On the contrary, the MAEtxt is designed to focus on the skills specifically required for the behavioral sciences, just those that are intended to be established during academic training and modeled in daily teaching practice, in addition to being represented in the skills that are socially expected of professionals in these disciplines (Santoyo, 2021), which implies a high relevance with the contents and allows a link between the practice of the skills and their evaluation. The MAEtxt is a tool that guides the learner to perform an exercise of analysis and generation of arguments from the texts that are curricularly programmed in the classes, so that students can perform these activities of deduction, relation, evaluation and creative generation of alternatives on the raw material that the same discipline has considered relevant to form the graduate profile. Thus, the progressive change in that argumentation that they generate becomes an object of study and a space for the practice of critical thinking (Colmenares & Santoyo, 2021; Huicochea & Rubio, 2018). Several studies have shown its usefulness for this, both at different levels of professional training (Espinosa, Santoyo & Colmenares, 2010) and in different institutions and different behavioral sciences (Bazán, García & Borbón, 2005; Cepeda, López & Hickman, 2021).

An indispensable element to promote such progressive change is the feedback that students receive from their performance. This element is often overlooked in many educational interventions, but it is essential, as will be seen in the following section.

Feedback

In technical terms, feedback is the information that we receive as a consequence of our own performance (Hattie & Timperley, 2007) and that can include aspects such as the relevance, comprehensiveness or adjustment to the criterion of our behavior, or complementary aspects such as alternative ideas, elements that had not been contemplated, what the performance lacked to reach the criterion or to have another type of result, etc. And all this is done to influence, reinforce and modify behaviors and concepts in the learners (Sarkany & Deitte, 2017). In the context of MAEtxt, we have sought to systematize feedback, in order to identify which elements are most useful to provoke the expected changes. The effectiveness of specific and personalized feedback has been tested, where the criteria achieved are exhaustively pointed out, the rule is reiterated to induce future responses that reach the criteria that have not yet been achieved, and the direction in which progress can be made to continuously improve is oriented (Colmenares, Espinosa, Morales & Santoyo, 2010; Santoyo, Colmenares & Morales, 2010). However, this type of feedback is highly costly for teachers in terms of work and time dedicated, which makes it not very viable in massive groups of public universities where it is necessary to evaluate and provide feedback to 60 or 80 people in each scheduled exercise. And alternatives such as general group feedback, according to these same experiences, are of low effectiveness, at least in the case of novice students (first semesters of undergraduate studies).

In an attempt to generate equally efficient but less costly alternatives, we have developed the proposal of a feedback that we have called generic, based on the structure of the response (Santoyo, Ortega & Torres, 2021), which is capable of providing the essential information so that the student can (1) have in advance a model of the expected response and (2) compare his or her performance with a clear and explicit criterion, which in turn will allow him or her to recognize the missing elements to meet the criteria, understand the meaning of the scores and -possibly- guide his or her efforts to achieve the programmed formative goals. All this, without the need to make an exhaustive evaluation of content, forms of writing, and other particularities of the student's open-ended responses.

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The model of strategic analysis of texts

As presented in other works (Santoyo & Colmenares, 2016), the MAEtxt consists of 16 tasks corresponding to categories conventionally contained in behavioral science texts, and whose identification, deduction and analysis allow a deep understanding of the text and a connection of its content with other relevant learning. If we abstract the structure of an expected response for each of the categories, we can obtain a description like the one presented in Table 1.

Category	Expected structure
Theoretical Justification (TJ)	Two elements: (1) the argumentation used by the author to present his theoretical proposal and (2) the limitations of previous studies from which it derives.
Methodological Justification (JM)	Two elements: (1) the argumentation used by the author to present his methodological proposal and (2) the methodological (procedural) limitations of previous studies that gave rise to it.
Social Justification (JS)	Two elements: (1) brief description of a problem of social relevance and (2) the argumentation used by the author or inferred by the reader on how the study would help to address that problem.
Basic Assumptions (SB)	Each assumption is a sentence or premise that accounts for an explanatory argument that we assume to be true on the basis of what is stated in a given theory or model.
Objective (O)	A sentence that indicates what is intended to be achieved in the study and contains two elements: (1) a verb according to the argumentative, evaluation or manipulation procedures carried out and (2) the experimental or argumentative conditions.
Analysis Unit (AU)	A sentence with three elements: (1) the dependent variable(s), (2) the independent variable(s), and (3) the functional relationship between them (one variable depends on the other).
Argumentative Strategy (AS)	A short sentence or paragraph that abstracts and synthesizes the description of the style in which the author presents his/her arguments and results (how he/she presents the information and structure of the writing).
Methodological Strategy (MS)	A short sentence or paragraph that abstracts and synthesizes two elements: (1) the methodological conditions or experimental manipulation carried out and (2) the name of the design employed (or comparisons).
Results (R)	A short sentence or paragraph that abstracts and synthesizes two elements: (1) the main (most important) results obtained in the study according to the manipulation performed and (2) the value that these results represent or support.
Internal Coherence - Argumentation (IQ-A)	A short sentence or paragraph that integrates three elements: (1) a value judgment of the structure of the article and/or the relationship between the sections, (2) the elements of the text that are evaluated, and (3) the valid argument as to why this adds or subtracts validity.
Internal Consistency - Internal Validity (IC-VI)	A short sentence or paragraph that integrates three elements: (1) a value judgment about the effectiveness of the variables or the evaluation of the internal validity of the work in terms of the experimental control conditions, (2) the elements of the text that are evaluated, and (3) the valid argument as to why this adds or subtracts validity.
External Consistency - Generality (EC-G)	A brief sentence or paragraph that integrates three elements: (1) a value judgment regarding the generality of the work, (2) the elements of the text that are evaluated, and (3) the valid argument as to why this adds or subtracts validity.
External Coherence - Relationship to Literature (CE-L)	A short sentence or paragraph that integrates two elements: (1) a value judgment on the consistency with other studies known to the analyst, and (2) the clear and explicit relationship of the results found by the author with the results of those studies.
Author's Conclusions (CA)	A brief sentence or paragraph integrating at least two of three elements: (1) brief description of the author(s)' conclusions (optional), (2) value judgment on the consistency of the conclusions with other sections, and (3) valid argument supporting such evaluation of the author's conclusions as related to the objective.
Own Conclusions (CP)	A sentence or short paragraph that presents a novel argument (that is not in the text) from the integration of different elements and DIFFERENT to the conclusion given by the author.
Alternative Courses of Action (AAC)	A brief sentence or paragraph that integrates two elements: (1) one or several methodological (procedural) and/or argumentative (theoretical) alternatives that overcome the limitations found in the present study, DIFFERENT to those presented in the text and (2) a brief explanation of how these limitations could be overcome.

Table 1 Structure of expected responses for each of the MAEtxt categories
Source: Own elaboration

Grading the response structure is considerably faster than giving specific feedback, and this could be a great technical advance for the generality of the application of this strategy. However, it is necessary to test generic versus specific feedback before proposing it for educational use in mass groups. For that reason, the objective of the present research was to compare the effect of two types of feedback: generic or specific, on the performance of a group of high school students in front of different exercises of strategic text analysis with MAEtxt.

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In the following sections, the method used is described, specifying the operational characteristics of each type of feedback. Subsequently, the results obtained are presented and finally, the relevance of structure-based feedback as a viable educational tool for training in critical thinking and flexibility that allows professionals in training to practice professional decision making is discussed.

Methodology

Participants

A natural group of 11 students enrolled in a curricular subject of the eighth and last semester of the bachelor's degree in Psychology at a public university, 7 women and 4 men, participated.

Instruments

Six actual published scientific articles relevant to the curricular objectives of the subject were used as material for the analysis exercises.

Ev.	Article
Base Line	Watson, J. B., & Rayner, R. (1920). Conditioned emotional reactions. *Journal of Experimental Psychology, 3*(1), 1-14.
Ej. 1	Haney, C., Banks, W. C., & Zimbardo, P. G. (1973). A study of prisoners and guards in a simulated prison. *Naval Research Reviews, 9*, 1-17.
Ej. 2	Seligman, M. E., & Maier, S. F. (1967). Failure to escape traumatic shock. *Journal of experimental psychology, 74*(1), 1.
Ej. 3	Rachlin, H. & Green, L. (1975). Commitment, choice and self- control, *Journal of Experimental Analysis of Behavior, 17*(1), 15-22.
Ej. 4	Ariely, D., & Wertenbroch, K. (2002). Procrastination, deadlines, and performance: Self-control by precommitment, *Psychological Science, 13*(3), 219-224.
Ej. 5	Thomas W. Farmer & Robert B. Cairns. (1991). Social Networks and Social Status in Emotionally Disturbed Children. *Behavioral Disorders, 16*(4), 288- 298.

Table 2 Texts that were analyzed in the different exercises of this instructional experience
Source: Own elaboration.

It is important to note that all the articles included in this experience are in their original language, English, which is different from the students' mother tongue. This is because the course was advanced and a full understanding of the technical texts in a foreign language is expected as a requirement for graduation. When asked, the group did not state that they had had problems with the language, but this is an aspect worth considering when analyzing this experience.

The exercises handled through the online platform asked the student to answer 16 tasks regarding the content of the reading reviewed. Each of these tasks corresponded to the identification, analysis, synthesis or evaluation of one of the 16 categories of the MAEtxt Model of Strategic Text Analysis (Santoyo, 2021).

For the evaluation we worked with a four-point Rubric, which assigns a score of zero to absent answers, 1 point to incorrect or incomplete answers, 2 points to each task that partially fulfills the requirements of the model, and a score of 3 to each answer that satisfactorily fulfills these requirements. Thus, the maximum possible score is 48 points, and the minimum expected to establish a basic mastery of the skills would be 32 points.

Procedure

At the beginning of the course, and after explaining the relevance of strategic text analysis skills for the professional practice of psychology, a first exercise was carried out to serve as a baseline and to establish a reference point for each student, with James Watson's classic article from 1920. After the first application, a broad presentation on the Text Analysis Model was made using the first reading as an example. The teacher proposed several possible correct answers for each category, which, without being textual or identical to each other, would meet the expected criteria, while explicit doubts of the students were resolved. Subsequently, an exercise was assigned every three weeks, during which the text and questions were available for five days for consultation and resolution.

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The group was aware that the readings were an essential part of the class, and that they represented topics that would be reviewed and discussed with the professor in charge, as well as the weight that the delivery of the analysis exercises would have on the final grade (40%). After each submission, each student received a response to his or her analysis, corresponding to the programmed feedback and the absolute score obtained. This was done by randomly assigning students to one of two groups: the first group would receive generic feedback on their first two analyses, and then receive specific feedback on the next two, ending again with generic. On the other hand, the second group would first receive specific feedback in the first two analyses, then generic for two exercises, and would end with specific.

Considering the objective of the research, the types of feedback were defined as follows:

Generic: The feedback does not depend on the particular characteristics of each response, but on the level of execution and expected structure of the category (see Table 1). It serves the function of modeling the expected structure of the response. The operationalization of how each response received was fed back is presented in Table 3.

Execution Level	Generic feedback
1. The response suggests little understanding of the task, is obvious, circular, textual copy or other category.	The lack of relevance of the response is reported and the expected structure in each category is described.
2. The answer is incomplete, it does not show integration or synthesis, it may still include some textual elements.	The partial relevance of your response is reported and the expected structure for the elements that remain to be developed is described. No reference is made to the textual or the need for integration.
3. The response includes all the expected elements and the appropriate content (with proper words) of the category, even if it has structural errors such as clutter or unnecessary length.	The correct execution in the category is indicated.

Table 3 Form of generic feedback for each level of execution in MAEtxt
Source: Own elaboration

Specific: The feedback responds differentially to particular student responses. It is a function of the configuration (structure and content) embodied in the student's response in each category and contains three aspects: (1) an acknowledgement of the appropriate elements of the student's response, (2) a pointing out of those missing or mismatched elements of the response, and (3) some brief recommendations for improving the student's response. The general characteristics of the feedback are presented in Table 4.

Execution Level	Specific feedback
1. The response suggests little understanding of the task, is obvious, circular, textual copy or other category.	It includes a description of the category, an invitation to construct your response without repeating textual information, and points out particular aspects to which you should pay attention in order for your response to meet the criterion.
2. The answer is incomplete, it does not show integration or synthesis, it may still include some textual elements.	The relevance of the elements and arguments that are presented, what is missing from the structure of the answers, and what is present but not relevant given the same structure are mentioned. Suggestions for constructing the response with the reader's own language or the invitation to critically reflect on the text can be included in the evaluation categories.
3. The response includes all the expected elements and the appropriate content (with proper words) of the category, even if it has structural errors such as clutter or unnecessary length.	The achievement of each criterion is explicitly recognized. Suggestions for improving the synthesis, integration and coherent order of ideas may be included.

Table 4 Form of the specific feedback for each level of execution in the MAEtxt
Source: Own elaboration

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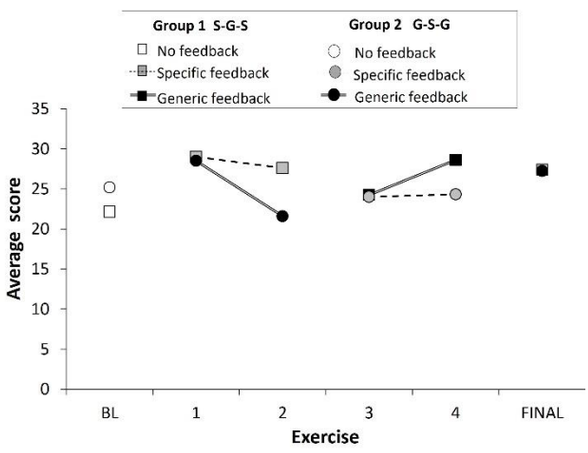
Thus, each exercise received feedback for each of the MAEtxt responses, in addition to the score per response and the total sum. Additionally, throughout the school year, the categories were elements present in the development of group discussions on the items in class, with the aim of clarifying their meanings and applications. Specific doubts were also solved and examples were given according to the students' requests.

Results

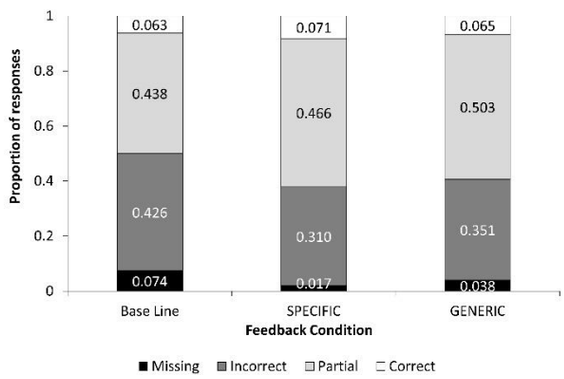
Figure 1 shows the average score of each of the groups throughout the instructional experience. In the points that are represented without filler, which represent the diagnostic measure or baseline, it can be observed that the groups begin the experience with similar scores, below the criterion. Although the central tendency is similar, the dispersions in this diagnostic measure are wide, especially in the case of group 1 (Group 1: *M*=22.167, *SD*=8.20; Group 2: *M*= 25.2; *SD*= 2.77). In the last measurement, both the group that started with generic feedback and the group that started with specific feedback showed almost identical scores, and higher than the initial ones, and with equivalent dispersions (Group 1: M=27.4, SD=2.97; Group 2: M= 27.25; *SD*= 2.87).



Graphic 1 Average score of the group in each of the exercises of the instructional experience
Source: Own elaboration

There is variability between the scores in each of the exercises, although there is a similar trend in that both groups benefit from receiving the first feedback and perform better in exercise 1, although the gain of the group receiving specific feedback is greater. From exercise 1 to 2, both groups perform lower, although those receiving generic feedback decreased their average score more. In exercise 3, both groups changed the type of feedback received, and the effect is maintained: Group 1, which at this point received generic feedback, had even lower scores than in the previous exercise, while group 2, which started receiving specific feedback, improved its scores. For the next exercise group 1 recovered its score, and group 2 continued to improve, but to a very small extent. For the final exercise, when both groups received back the type of feedback they started with, group 1, which returned to specific feedback, lost some of its progress and group 2, which returned to generic feedback, had an improvement of almost 4 points on average.

This analysis of average scores suggests that both types of feedback improve performance, and that specific feedback may be more effective by a small margin. However, it may be useful to compare the proportion of correct, partial, incorrect, or missing responses as a function of each of the conditions. This is shown in Graphic 2.



Graphic 2 Proportion of responses under each of the feedback conditions
Source: Own elaboration

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As can be seen in Figure 2, both types of feedback cause a difference with respect to the baseline: the proportion of absent and incorrect responses decreases, the proportion of partially correct responses increases, and the proportion of responses that satisfy the criterion increases, the latter especially in the case of specific feedback. Additionally, the data suggest that specific feedback is indeed more effective in decreasing missing and incorrect responses, and in increasing the number of fully satisfactory responses, although the difference between the two types of feedback is actually very small.

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Conclusions

In this study, the systematic monitoring of a real and situated educational experience was carried out to compare the effect of generic feedback versus specific feedback, on the performance of a group of undergraduate students against six exercises of strategic text analysis with MAEtxt.

In general, the results of the initial measurement coincide with previous studies that indicate that, without explicit help, undergraduate students are not very effective in reading comprehension (Flores-Macías, 2021; Santoyo, 2001). However, from the HMC model, the aim is not only to promote a better comprehension of what is read, but also to contribute to the exercise of complex thinking skills. At the professional level, it is not necessary to consult texts to store knowledge in memory, but to make decisions about them: to decide whether they can be considered as references, whether they should be criticized, whether the ideas expressed could be replicated, whether their findings require or could be expanded, etc., and this should be done from a critical, flexible and constructive perspective. Thus, the MAEtxt was designed so that, during higher education, there are opportunities to practice this decision making.

We start from the evidence that explicit training in these skills is effective in improving performance in the management of scientific information contained in the readings that are typically reviewed during a course at the undergraduate level (Santoyo, Ortega, Torres & Colmenares, 2017). The present results add to the evidence supporting the effectiveness of MAEtxt and its generalizability across subjects, levels of study, and among different related disciplines.

We also had precedents suggesting that personalized and specific feedback is highly effective in guiding students in improving their skills of identification, analysis, deduction, synthesis, and evaluation of text elements (Colmenares et al, 2010). However, we have also confirmed through experience the impossibility of maintaining such detailed feedback when dealing with massive groups in which the formative purposes of the class merit, for example, the discussion of one reading per week. This demand increases the workload for teachers to unmanageable levels. The present effort is part of the search for alternatives that make it possible to evaluate student progress, give them useful information that allows them to adjust their answers, and verify if there is indeed an effect of such feedback, without the need to invest a great deal of time in each of the answers per student.

The study reported here was conducted with a small group of advanced Psychology students. The number of participating students made specific feedback possible, which would otherwise be highly complicated. And the advanced level made it possible to compare the results with other previous studies conducted with students in the first semesters of the course, in which non-specific feedback presented low effectiveness (Colmenares et al, 2010). In the present experience, the two types of feedback were equally effective, increasing the quality of the responses and the average scores in very similar proportions. Possibly the difference in results between the two experiences is related to the level of advancement in professional training, since it would be logical that disciplinary knowledge provides more elements with which students can analyze the reading material.

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The other mechanism that could explain the difference is that the feedback that in this work was called "generic" is much more systematic than the general feedback used in 2010. As described in the method section, this feedback may not be fully personalized, but it does respond directly to the way students respond, and provides relevant information about the criteria to be met. It is possible that students with more disciplinary elements, as is the case of the group that participated in this experience, when supported by feedback based on the structure of the expected response, may be able to derive the rule successfully and apply it effectively to various tasks.

On the other hand, for future research it would be worth considering the language barrier as an additional element in the task. It is relevant to identify whether the fact that the readings are in a non-native language, although familiar to the students, represents a difficulty in the comprehension and handling of the information. Rather than treating it as a possible extraneous variable, it would be valuable to place this as an object of research interest and look for the mechanisms through which the students face and resolve this situation in order to try to respond to the exercises.

The analysis of the sequence of progress from one exercise to the next is relevant because the students have in each exercise a practice opportunity that increases their experience with MAEtxt, but it is important to emphasize that each new exercise implies a process of transferring skills to a new task with a new text whose characteristics change naturally. It is to be expected that the texts represent differential difficulties, depending on their structure, length, the type of argumentative strategy, etc. Therefore, a result such as the present one, where progress is not constant and progressive under any of the feedback conditions, is to be expected and typical according to previous studies (Santoyo, 2021). Additionally, it is important to call attention to the fact that an overall effect of the two groups is being presented for the moment, through descriptive measures of central tendency, but it should be remembered that averages can hide individual differences that are usually wide in this type of exercises (Colmenares & Santoyo, 2021).

It will be important in future studies to find ways to identify differential profiles and trajectories that allow us to assess specific strengths and areas of opportunity for particular students.

The present work suggests that generic feedback based on the structure of the expected response can be as effective as detailed and personalized feedback to improve skills, although it also confirms the finding that 5 exercises are not enough to achieve educationally expected improvements, since at the end of the experience a score that met the satisfactory criteria in the 16 categories of the MAEtxt had not yet been achieved. This reiterates a "ceiling effect" that we have not managed to break (Colmenares & Santoyo, 2021; Espinosa et al, 2010; Santoyo & Colmenares, 2016) and that possibly needs more intensive or lasting interventions, in order to be achieved. Ideally, in fact, this type of experience should not be restricted to one semester or one subject, but throughout the entire professional training there should be this type of exercises, appropriate to the contents of each level, and that would allow a consistent practice of methodological, conceptual and professional skills that accompany the development of critical thinking and flexibility in the face of novel situations. This would surely result in professionals who are better prepared for the challenges of a complex reality that requires solutions and proposals to its pressing problems.

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