

Ideas of students and faculty about reading and writing in science and technology careers

Las ideas de los estudiantes y profesores sobre la lectura y la escritura en carreras científicas y tecnológicas

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Abstract

The objective of this work is to characterize the ideas that students have about reading and writing as they start their studies at university level in science and technology careers, and the ideas that faculty members have regarding students' writing and comprehensive reading. The study was conducted at the entry level in the Faculty of Exact, Physical and Natural Sciences of the National University. Data was collected by means of semi-structured questionnaires, in-depth interviews, and lesson observations. Results show that students find differences between reading and writing at secondary school and at university levels, that they value positively being taught graphical tools that are useful to organize and represent knowledge and that they are not fully informed about how efficient writing can be when used as a tool for thinking. The main associated obstacle found by faculty is the comprehension of texts and assignments given to students as part of their studies. Faculty members consider that reading and writing skills should have been developed already at secondary school level.

Key words: reading, science, technology, university, writing.

Resumen

El objetivo de este trabajo es caracterizar las ideas que tienen los estudiantes acerca de la lectura y la escritura al comenzar sus estudios universitarios en carreras científicas y tecnológicas. También se describieron las ideas que tienen los profesores con respecto a la comprensión lectora y la escritura de los estudiantes. El estudio fue realizado en el ingreso universitario de la Facultad de Ciencias Exactas, Físicas y Naturales de

la Universidad Nacional de Córdoba en Argentina. Los datos fueron recolectados a través de cuestionarios semiestructurados, entrevistas en profundidad y observaciones de clases. Los resultados muestran que los estudiantes encuentran diferencias entre la lectura y la escritura realizadas en la escuela secundaria y la universidad, que valoran positivamente la enseñanza a través de herramientas gráficas que permiten organizar y representar el conocimiento y que no están completamente informados sobre la eficiencia de la escritura como herramienta del pensamiento. Los profesores señalan que la principal dificultad de sus alumnos es la falta de comprensión de los textos y de las consignas dadas durante el cursado. Los profesores consideran que las habilidades de lectura y escritura deberían haber sido desarrolladas completamente en la escuela secundaria.

Palabras clave: lectura, ciencia, tecnología, universidad, escritura.

INTRODUCTION

From the 1970s onwards, several American, British and Australian universities carried out research centered on the development of writing skills in university students. All these works are focused on the fact that learning writing skills is a process which is not completed when students finish secondary school, and that knowing how to write is essential to learn any course (Bazerman & Russell, 1994; Russell, 1990). Afterwards, several pieces of research on different levels of the educational system proved the value that both reading and writing have for the comprehension of scientific concepts (Armstrong, Wallace, & Chang, 2008; Gunel, Hand, & Prain, 2007;

Hand, Hohenshell, & Prain, 2007; Lakrim, 2007; Rivard, & Straw, 2000; Wallace, 2004). Besides, contributions show that reading and writing are key elements to develop competences in the argumentative practices of disciplines, and that they play a central role in the creation of learning communities (Carlsen, 2007; Kelly, & Bazerman, 2003). However, science teachers often highlight that students start their university studies with deficiencies in reading comprehension, writing, handling context specific terms, and note taking, so that those become central problems of science teaching in higher education (Milwaukee Area Technical College, 2006).

In Argentina, the setting is different from the one described above: research about reading and writing at university level started later and, in most of the cases, it was carried out in social-related disciplines. Results yielded in this context show that few teachers are aware of the cognitive challenge that the reading and writing proposals they make to students imply. Moreover, they do not provide students with strategies that could help them understand the texts read in university courses (Carlino, 2002; Estienne & Carlino, 2004). On the other hand, in science and technology university careers, there are teachers' proposals that integrate methodologies applied for the development of reading and writing skills (Iglesia & De Micheli, 2008; Richter & Carr, 2008). However, very few institutional curricula include teaching reading and writing along a complete university career (Moyano, 2009).

When taking into account both the abovementioned antecedents and lack of information about reading and writing practices in scientific-technological careers in our country, it is important to carry out more comprehensive research in this field. In order to achieve this, the research reported in this paper was done to characterize the ideas that a group of teachers and students of science and technology university careers have about the role that reading and writing plays at university level.

The study was conducted at an entry level course taught for the 15 university careers at the Faculty of Exact, Physical and Natural Sciences of the National University (Biological Sciences, Geological Sciences and nine Engineering careers, among others). This course lasts for one month, and it was chosen as a research area because it is the place where students produce their first writings at university level.

METHODOLOGY OF RESEARCH

Data was collected by means of two semi-structured questionnaires, one for students and the other one for faculty members.

The questionnaire for students consisted of one closed question designed to know about the strategies that they used to apply at secondary school to study and five open questions, out of which three were designed for them to describe the characteristics of reading and writing at secondary school. The other two questions were asked to inquire about the difficulties in reading and writing that they think they will encounter during their university studies. Furthermore, 25 closed questions were designed using a three-point Likert scale (1= fully agree, 2= partially agree, and 3= disagree). These 25 questions were asked based on four dimensions of analysis: the characteristics attributed to reading and writing at secondary school, at the entry level, at university and the relationship that is established between having knowledge and expressing knowledge.

The questionnaire for faculty members consisted of three open questions designed for them to describe the difficulties that students may encounter during the entry level, the skills that they should have developed before starting this level and the differences that faculty make between reading and writing practices at secondary school and at the entry level. Besides, 16 closed questions were added using the same Likert scale described above, and based on three dimensions of analysis: the characteristics attributed to the activities included in the study material, the characteristics of the classes during the entry level and the relationship that is established between having knowledge and expressing knowledge. All of the questions were designed in accordance with the categories of ideas about reading and writing at university level presented by Ellis (2004). Moreover, previous studies about these topics made in universities in Argentina were considered (Brunetti, Stancato & Subtil, 2002; Fernández & Carlino, 2008).

A conglomerate probabilistic sample was chosen so that students from all the careers of the Faculty are represented proportionally. The questions were asked to 291 students and to 12 faculty members. In order to deal with the answers found in the questionnaires, and to corroborate them, in depth interviews were conducted to 10 students (eight from Engineering, one from Geological Sciences and one from Biological Sciences). Finally, observations and audio records were made in all the lessons given by two faculty members. The criterion applied for choosing these people was their experience as university teachers: one of them had been teaching at the entry level for more than 15 years and the other one was experiencing teaching at this level for the first time.

Fos data analysis, the quantitative sections of the questionnaires were analyzed using the SPSS program, calculating agreement and disagreement frequencies with the assertions included in the questionnaire. The qualitative sections of the questionnaires, the interviews and the records of the lessons were analyzed using the QDA Miner program. This program allowed the allocation of codes to certain fragments of the transcriptions of questionnaires, interviews and lessons, as well as the analysis of coding frequency and the comparison of results.

RESULTS OF RESEARCH

Reading and writing at secondary school and at university: comparison and contrast established by students and faculties

According to their answers to the questionnaire, students highlighted summaries as the main tool they used to resort to at secondary school. Less frequently used were making comparative charts, overviews and conceptual overviews (see Figure 1). Even though these tools are included in the contents for the entry course, no teacher in the observed lessons stressed teaching them. In addition to this, in several occasions the most experienced teacher mentioned that these tools had already been studied at secondary school, so they would not be the subject of study during this course.

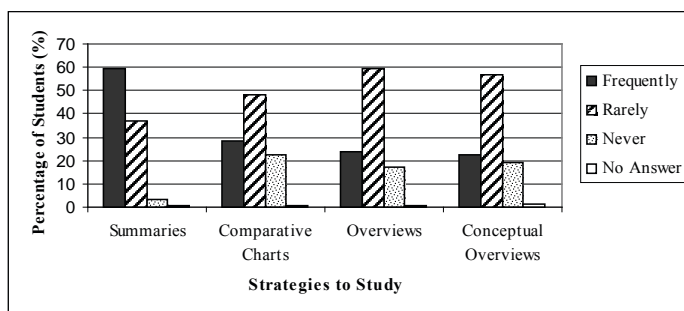


Figure 1. Strategies to study applied by students at secondary school (n= 291).

Furthermore, the interviews conducted showed that most of the students identified themselves as having had poor performance both in reading and writing during secondary school. In this sense, they expressed that their best skills in the field of Mathematics and their difficulties reading and writing were decisive elements when they had to choose their university career.

On the other hand, the questionnaire included inquiries about the amount of material given for study and the complexity of texts. Ninety one percent of the students fully agreed that studying at university level demands more time devoted to reading than the one devoted at secondary school, and 87% agreed that they have to read more texts at university compared with secondary school. As far as the complexity of texts is concerned, 77% of the students asserted that the study material they have to work with at university is more complex than the one at secondary school. The results of the interviews fully agreed with these trends.

As regards the answers from faculty, five teachers stated that the main difference between secondary school and the entry level lies in the complexity of topics, and they mentioned - in a lesser degree- that secondary school fails to foster autonomy and initiative. None of them made reference to differences in the amount of study material.

Moreover, during the lessons, teachers highlighted some differences between these two levels of the educational system. In the case of the most experienced teacher, when referring to the problem of secondary school, he said: "It is becoming more and more noticeable, little reading and little writing". The inexperienced teacher did not refer to problems related to language; however, he criticized the autonomy expected from university students.

The characteristics of reading and writing at the entry level

Interviewed students mentioned their difficulties to read, especially because of the lexicon used and unknown authors, which implies an obstacle to differentiate what ideas are to be associated with each author. Most of the students indicated that they did not have difficulties understanding the assignments in textbooks.

In the interviews, students established a difference between activities important to be done in written and others for which writing is not necessary. They highlighted the fact that they need to write those activities that allow them to organize their thought, such as comparative charts and conceptual

overviews, and they gave little value to those activities that lead to reproducing ideas or to establishing simple relations between concepts.

Regarding faculty's opinions, eight of them mentioned that the main problem is assignment interpretation from students, and the rest stated that students have difficulties solving problems. On the other hand, whereas eight teachers considered that students should have learnt to interpret assignments at secondary school, nine teachers said that the entry level is a space to learn how to solve problems.

The role of reading and writing at university

As for the epistemic potential of writing, 84% of the students said that writing ideas while reading a text helps understanding the topic. Nevertheless, when they were asked specifically about the function assigned to writing at university, students stated it works as record or note taking in the first place (42%) and as answers to questions in exams and communication with teachers in a lesser degree (20% and 13% respectively). During the interviews, students stressed that writing helps memorizing and favors re-reading. They also focused on the functionality of writing for note taking.

The analysis of questionnaires made to faculty reveals that all the surveyed teachers agreed that writing is a tool that helps to think. However, 10 faculties said that university does not represent a space to continue learning how to read and write.

In regard to lesson observation, it is important to highlight that the most experienced faculty made reference to the importance of reading concerning the development of imagination, connecting it with the knowledge provided by an illustrate patrimony and presenting it as opposed to the use of technologies: "Matters that men need start being left aside, such as reading to develop imagination and creativity. Let's resume good habits as we are losing them, either because of the computer, computer games or other activities. [This leads us] to detach from these good habits that our great grandparents, grandparents and parents used to have". Additionally, he referred to the importance of writing for professional work, and focused on making reports. He stressed proper writing and orthography but did not mention structure or possible addressees. On the other hand, the less experienced faculty did not refer to the importance of reading and writing at all.

The relationship between having knowledge about a topic and expressing that knowledge

In the questionnaire, 56% of the students fully agreed with the idea that having knowledge about a topic equals being able to express that knowledge properly during a written exam. Nevertheless, during the interviews, most of the students stated that they have little capacity to synthesize, define and reformulate ideas during a written exam.

Most of the faculty members established the same correspondence as students: eight of them agreed with the idea that having knowledge about a topic is a synonym of being able to communicate it. During the lessons, the most experienced faculty insisted on the need to understand assignments for activities, stressing that students may know the topic but misinterpret a statement and, consequently, provide the wrong answer to a question. However, none of the observed lessons was centered on assignment interpretation.

DISCUSSION

The results presented in this article prove the wide usage of summary at secondary school compared with other strategies that require deeper text reading. These data coincide with studies such as the ones carried out by Mateos, Martín and Villalón (2006). These authors indicate that the most frequent tasks at the Spanish secondary school are note taking, reading and underlying, the identification of main ideas and summary and chart making after reading a text. Moreover, they signal that the least developed tasks are schemes, conceptual overviews, and essay and reflection writings.

The results about the difficulties that students have when they are faced with reading textbooks from the entry level coincide with the research carried out by Fernández and Carlino (2008) in Argentina. According to them, students stress that the complexity of texts, as well as the presence of new vocabulary and new authors are the main obstacles they come across when approaching texts at university. The difficulties related to discursive genres reported by Iglesia and De Micheli (2008) were not evident in the results yielded in this research.

As regards knowing about a topic and being able to express knowledge, both faculty and students find it difficult to view exams as activities that demand relating what someone knows about a topic and what the writing situation demands. This aspect, taken by Carlino (2005), addresses the importance for both students and faculty to start adopting the idea that exams can require the construction of several types of texts, with different purposes and different addressees, which demands new challenges that imply continuing learning to read and write at university level.

Finally, it is important to highlight that Meneses (2008) has described ideas about reading and writing similar to the ones described in this paper for lesson observations. The author describes that one of the ideas in the Chilean school frames reading as the approach of texts associated with illustrate patrimony and writing as the conservation of language: orthography, vocabulary and calligraphy.

CONCLUSIONS

As closure, the following conclusions are provided:

- Students value positively being taught graphical tools that are useful to organize and represent knowledge (comparative charts, overviews, conceptual overviews).
- Faculty members take a critical position of the formation that students receive at secondary school. However, they omit to teach those skills that are scarcely studied at secondary school and that students' value (for example, conceptual overviews).
- Both students and faculty members view the potential of writing as a tool for thinking. Nevertheless, action is needed that aims at broadening students' perspective about the multiple functions that writing can have, as well as action that allows faculty to conceptualize writing as a tool feasible to be taught in every discipline at university.
- Both students and faculty have difficulties conceptualizing assignments as tools that mediate between previous and new knowledge, and argue that there is a reciprocal relationship between having knowledge about a topic and expressing that knowledge.

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It was found that the most frequent inside noise, faced by schoolchildren, is noise coming from the corridors and the neighbouring classrooms and to a lesser extent, noise coming from the phone and from the ventilation or heating system. Statistically significant differences were found in the degree of inside-school noise annoyance reported among school children from different regions, with urban pupils reporting the highest. This apparently is due to large school units existing in urban areas.

It was also found that a small percentage of children indicated that noise plays an important role in distracting them during lesson. Girls are more affected by noisy environments as they stated that noise can distract them from their work. The finding is in accordance with Enmarker & Boman, who also reported differences between genders, indicating that the girls appear to be more distracted by environmental noise (Enmarker & Boman, 2005).

In conclusion our results revealed that children of the largest city that participated in the study were more exposed to internal and external noises and also reported higher levels of perceived annoyance. Moreover, the most common perceivable external noises were those produced by vehicles and from the voices of children in the schoolyard. Regarding indoor school noises, children appeared to be chiefly disturbed by the noises in the corridors and the neighbouring classes. Finally, children did not report any particularly negative attitude towards indoor school noise since they did not consider it fully responsible for distracting them during the lessons.

The present research is a pilot study, part of a research project currently under way aiming at gathering information on the types of noises schoolchildren face during the lessons and the degree of disturbance noise cause to them. Many factors such as diversity of schools, age, gender of students and socio-economic status of the family are being taken in account. This information will help us to implement effective measures for the minimization of noise in schools.

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