Compensatory Skill: The Dyslexia's Key to Functionally Integrate Strategies and Technologies

Michele Della Ventura(✉)

Department of Music Technology, Music Academy "Studio Musica", Treviso, Italy
micheledellaventura.mdv@gmail.com

Abstract. Dyslexia is a theme that commits teachers to define strategies and methodologies suitable for guaranteeing educational success even for dyslexic students. In this sense, the development of teaching technologies has supported teachers on the one hand and (dyslexic) students on the other hand: this does not mean that technology is the solution to teaching/learning problems. The purpose of this article is to build a table of process indicators that can be useful to teachers as a guide for designing the learning process. Process in which learning experiences, supported by new technologies, can be organized in different ways, in order to meet the needs of the entire class group, intended as a group of heterogeneous students as far as learning (dyslexic and not dyslexic students), but also personal life styles are concerned. Schools will increasingly face these problems in the future, and should be able to solve them with major changes in their identity.

Keywords: Compensatory skill · Didactic · Dyslexia · Learning strategy · Technology

1 Introduction

In the school of the twenty-first century, there is still a conception of teaching (that even if formally repudiated, continues to prevail in teaching practice) in which the fundamental concern of the teacher is to lecture, to explain, present, demonstrate, describe the concepts, in the best possible way. Each discipline has its own difficulties and this is the reason why students sometimes "experience" a feeling of inability that can lead to a drop in self-esteem and a drop in performance [1, 2]. A problem that concerns students in general but which takes on a particular significance considering an increasingly widespread reality in schools: students with Specific Learning Disorders (SLD).

The teacher finds himself first of all facing the problem of "diversity" (and therefore of "inclusion") within the class group [3] and must implement all those actions that tend to enhance the different individual situations, avoiding that the difference is transformed into inequality [4]. The didactic activity, in consideration of all the regulatory aspects, should not be seen as a "risk" but on the contrary "enhanced".

This is a clear example in which the pedagogical-educational aspect assumes the utmost importance compared to the regulatory one. From the history of pedagogy it

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emerges that the teacher must not only know the subject to be taught but also the most appropriate methods to teach it: according to Rousseau it is necessary to know the pupil [5], according to Pestalozzi it is essential to know the methods, and according to Dewey it is necessary to know the models of society [6].

In this sense, the development of teaching technologies supports teachers on the one hand and (dyslexic) students on the other hand: multimedia technologies can be used to improve teaching processes or to improve learning processes, or to improve both. The new technologies make it possible to transform teaching/learning methods, creating the best conditions for pupils to activate their mental abilities (imagination, fantasy, creativity, analysis, synthesis, induction, deduction, inference…) and consequently develop them [7].

This means that adopting innovative solutions regarding the tools with which to teach, inevitably produces the opening of major problems on the fronts of the "what" to guarantee with one's teaching (epistemology), of the "how" to guarantee it (teaching) and of the "why" to propose it in a certain way rather than another (technology).

From all this it follows that both the teacher and the student must have the skills regarding the technologies used in the learning process: skills and not just knowledge. Epistemological conceptions lead teachers, often unconsciously, to inadequate teaching practices (through an improper use of technologies) that send the student in difficulty back to a very tiring personal learning that distances him from the learning process.

The present research takes place within this whole context and investigates part of the problem, that means, it focuses on the teacher and the good practices he/she should follow in order to make compensatory tools (such as new technologies) effective tools for the dyslexic student during the learning process. Therefore, some indicators for monitoring the learning process are proposed. The use and analysis of these indicators can allow the teacher to define patterns and trends in the use of technologies by the dyslexic student, allowing him/her to develop a **compensatory competence** that allows him/her to integrate strategies and technologies together, based on of his/her learning style.

This paper is organized as follows.

Section 2 presents a brief introduction about the concept of dyslexia. Section 3 illustrates the concepts of compensatory tools and compensatory skills. Section 4 presents possible process indicators. Section 5 presents some important reflections related to the learning indicators. Finally, in Sect. 5 the paper ends with concluding remarks.

2 Who is the Dyslexic Student?

The school should help dyslexic students to live an educational path that is not conditioned by the difficulties due to dyslexia: a learning disorder that affects reading and writing, key skills in school. Reading and writing are considered to be so simple and automatic that it is difficult to understand the fatigue of a dyslexic student. Dyslexic students can write and read, but they manage to do so using their capacities and energies at the maximum, given that they cannot do it automatically [8]. They grow tired quickly, they make errors, fall behind, do not learn [9].

The reading difficulty of the dyslexic student may be more or less serious [10] and it is often accompanied by a disorder of the speed and accuracy of writing that is manifested

by frequent orthographic errors (dysorthographia) and/or difficulty in the execution of the graphic motion of such kind as to make the text become incomprehensible even to its own authors (dysgraphia) [11].

The dyslexic student appears disorganized in his activities both at home and at school. He has difficulty copying from the board and taking notes. He can't take notes, because he can't listen and write at the same time.

When he gets distracted from what he is reading or writing, he has great difficulty finding the point.

Direct consequences of all this are demotivation, low self-esteem, elusive behavior, oppositionality [12].

The teacher, in the planning of the learning process, can foresee specific compensatory tools and/or dispensative measures to support the student [13]: didactic and technological tools that replace or facilitate the performance required in the deficient skill (use of the computer, of visualization programs with spell checker, speech synthesis,…, not to perform some performances that, due to the disorder, are particularly difficult and that do not improve learning, longer times for checks,…).

It is important to emphasize that compensatory tools and dispensatory measures can improve the student's academic performance, but they are not an effective or sustainable long-term strategy.

What will happen when the student has to use a new technology?
What will happen when the student has finished their studies and will have to face the world of work?

Despite everything, the dyslexic student has all the potential to face school with satisfaction and success and, by taking advantage of the measures provided to overcome the obstacle of reading difficulties (compensatory tools and dispensatory measures), he/she can certainly achieve excellent results.

However, it is important to help him/her develop skills that allow him/her to acquire his/her own autonomy [14].

For a dyslexic student, learning one's own study method (learning to learn) means possessing the fundamental compensatory tool to which technological and didactic ones are added. Therefore, it is necessary for the teacher (together with the family) to help him/her develop a metacognitive approach to study [14, 15]: a setting that allows him/her to achieve good compensatory skills.

3 Compensatory Tools vs Compensatory Skills

Compensatory tools are all those tools, IT and otherwise, which aim to compensate for the disorder by supporting the student in his weaknesses. Under this large category can therefore appear video-writing programs with spelling checker, speech synthesis, the calculator, concept or mental maps, the multiplication table, the digital dictionary, etc. The compensatory instruments are however personalized and chosen by the student (or recommended by the teacher) on the basis of his needs and peculiarities [16].

In general, the maximum potential of compensatory tools is highlighted when, through the use of the digital textbook, different technologies can be used to access the text in an alternative way. The use of the tools, however, implies a training course, which takes into account not only the computer skills of the child but also the school and family context in which he finds himself. Technologies can be a valid support for one's profitable course of study, but they must be used with an active role not only by the child, but also by the school itself. The ideal would be to include them in a "compensatory teaching" [17] that provides for a teaching activity that can take into account the different individual learning styles and can thus promote an effective and adequate study method.

From the point of view of the study method, we can speak of "compensatory strategies" [18], that is all those procedures, expedients and techniques that can help to overcome the limits of the disorder. These strategies are very varied and variegated [19], and can be classified according to their objectives:

- strategies that integrate the written code with other codes, for example graphic-visual (concept maps, diagrams, graphics) [20, 21],
- strategies for storing and organizing information (tables, audio recordings,…) [22]
- strategies to enhance listening and concentration skills [21].

Compensatory strategies are highly individualized and are often personally identified by the student. The use of technologies, in this context, must be functional to the identified strategy, otherwise it loses its meaning and does not maintain the compensatory value it may have [23, 24]. In other words, the student must know how to use the tools really well, autonomously and effectively.

Based on all the above considerations, Table 1 summarizes the main operational differences between the approach to compensatory technologies and that to compensatory strategies.

Table 1. Differences between compensatory technologies and compensatory strategies.

Compensatory technologies	Compensatory strategies
Badly administered technologies can be seriously counterproductive: lengthening of time, loss of motivation and self-esteem	They rarely have contraindications. They can be more or less effective but it is very rare that they can be considered harmful
The use of technologies could only be useful to the dyslexic student and become a complication for other students	Often the strategies are useful to all students and therefore can be proposed to the whole class
Attitudes of rejection/acceptance can occur, which can be reduced, if not overcome, with serious pedagogical support both at home and at school with peers (peer-to-peer)	They have no stigmatizing characteristics and are much more easily accepted by the dyslexic student
Some technologies require the use of licensed software which may limit their use by students	The strategies have no cost and can be used with all students without problems

(*continued*)

Table 1. (*continued*)

Compensatory technologies	Compensatory strategies
A training course is required to acquire some basic skills and ensure the conditions for effective competence	They can also be introduced or suggested informally
Continuous personal research is necessary to find out about the news and the possibilities of application	They can also be acquired by the teacher/student by comparing them with colleagues
They are very difficult to monitor because the student's usage patterns should be observed continuously (at school and at home) Even at school the student is not alone in the classroom and the teacher cannot always and only be at her side	They can be easily monitored and modified/improved through specific indicators

Focusing once again on technologies, it is possible to state that from simple use to "competence" when you do not have a simple and generic ability to use, but a real mastery that allows you to use the tool in a way that is functional to one's own study method. With competence, strategies and technologies are integrated in a functional way, in a way that respects one's own learning style. Achieving good compensatory skills is therefore the goal that every student (dyslexic or otherwise) should achieve, with the help and support of all the reference figures around him, first and foremost the school.

4 Process Indicators

The use of technologies with appropriate strategies by the dyslexic student represents an important step in achieving the learning objectives.

It is important to underline that it is not enough to have a new technology, because the delicate transition between the acceptance of the technology by the student and the development of a real competence (in its active and conscious use) is an essential step towards a real autonomy. For this to happen, it is not only important for the dyslexic student to know the practical utility of technology, but it is essential for the student to understand that the use of technology will open up to him a world of experiences that will allow him to integrate into society and live peacefully (motivational drive).

In this new context, the teacher plays a fundamental role because she must know the technologies that the student will have to use to achieve the educational objectives, teach the student how to use technologies effectively and consciously, and above all monitor the correct use of the technologies by the student.

The operations of monitoring and analysis assume an indispensable role: without them the technologies will barely be able to emancipate from a perception that envisages it only in ancillary terms with respect to the education system and not, as it should be, as an element integrated into it and, actually, able to guarantee added value to it [23].

Monitoring must concern the way in which the dyslexic student uses technologies based on the teacher's instructions, but also through the observation of the attitudes and

Table 2. Process indicators.

INDICATORS RELATING TO THE INTERNAL PROCESS	
LEARNING RESULT AND/OR PROCESS REQUIREMENTS	INDICATORS
Social skills	• Increase in student loyalty • Increased empathy among class group members • Awareness of each student's skills, experience and work styles
Critical thinking	• The student describes the ideas clearly • The student understands which knowledge has been acquired and which has not
Inclusiveness of the student	• The student is able to participate in group work in an active way (recognizes the tools used) • The student identifies a need or opportunity from the context and problem indicated • The student demonstrates curiosity
INDICATORS RELATING TO THE LEARNING AND GROWTH PROCESS	
LEARNING RESULT AND/OR PROCESS REQUIREMENTS	INDICATORS
Communication	• The student is able to use technology as a tool for communication skills • The student uses images, links and text in the messages
Behavior	• Increased ability to independently search for relevant information • Increased ability to recognize relevant information and use it effectively in business • Increased ability to process and share ideas verbally and in writing • Increased ability to organize and give meaning to visual information • Increased ability to relate ideas from multiple topics in different contexts • Increase of the ability to reuse resources and knowledge • Ability to use information in different activities • The student demonstrates the ability to identify a need or opportunity from the context and problem indicated • The student is able to use technology to increase collaboration with other classmates • The student is able to select relevant technology tools and resources for learning • The student asks the teacher to help him/her: Never, Almost Never (1-2 times per lesson), A few times (3-5 times per lesson), Often (more than 5 times per lesson)
Acquisition of knowledge	• The student formulates hypotheses on the choice of tools to be used • The student identifies what is still needed to know • Reduction of confusion in the use of different tools

(*continued*)

Table 2. (*continued*)

	• Number of new tools used during work and communication • The student is able to develop skills to undertake independent learning • The student applies knowledge (about of the technological tools) outside of the classroom • The student is able to combine parts of school subjects with one another (multidisciplinary approach) • The student identifies the problem and recognizes the useful tools to solve it • The student is able to combine different tools to solve the problem, to reach the goal
Communication skills	• The student is able to use technology to develop ability to generate ideas and perspective to solve problems • The student is able to use technology to develop ability to investigate problems • The student is able to use technology to evaluate different sources of information
Involvement	• Increase of group approaches to problem solving • Number of approaches with a new perspective
INDICATORS REFERRED TO THE STUDENT'S PERSPECTIVE	
LEARNING RESULT AND/OR PROCESS REQUIREMENTS	INDICATORS
Sensations and perceptions	• Raising awareness of teamwork • Increased awareness of one's own skills • Increased perception of the opportunity to learn • Increased enthusiasm and self-esteem • The student change in motivation on the base of the subject • The student enjoys a sense of belonging and connection to school • The student feels included, cared for, and safe and secure
Behaviors and perceptions	• Interactions with class group members • More positive attitudes towards learning • Increase of the student's ability to persist in a task despite failure and difficulty • The student is curious and enjoy intellectual engagement • The student learns and works during the lesson at its own pace

behaviors that occur within the class group. The student should not feel isolated from other classmates, but on the contrary receive the necessary help from them too (peer-to-peer). In this way, those principles are activated that allow the creation of social bonds that lead to autonomy and an increase in self-esteem. Working with another partner or in a group strengthens important skills such as communication, critical thinking and empathy. Students can understand each other better and this facilitates listening: learning to listen to each other and respond constructively.

Monitoring and analysis can be done through the preparation of specific indicators. On the basis of the above considerations, some indicators that the teacher could consider to evaluate the (ongoing) learning process are listed below (see Table 2).

The choice of indicators, which are specific to each context (discipline or topic), depend on the teacher's values. Often the indicators individually provide useful information for monitoring the learning process, but sometimes it is necessary to carry out the analysis through the simultaneous combination of multiple indicators.

At the same time, better indicators could be discovered during the course of the teaching activity, which could replace or supplement those prepared.

5 Discussion

This research aimed to define a series of indicators useful for the teacher to improve the learning process of the dyslexic student.

In schools, students with specific learning disabilities are increasingly encountered. These students need personalized interventions and strategies in order to recover skills and be motivated. The personalization of the intervention must be: capable of responding to the need to construct training and learning paths for students; respectful of individual differences in relation to interests, abilities, rhythm of learning, cognitive styles, attitudes, inclinations, life experiences.

It is therefore necessary for the teacher to activate a virtuous process, which guarantees a systemic intervention and which produces a significant change in the learning process of the dyslexic student. This is achieved through an active participation of the teacher who favors in the student the maturation of specific skills to be constantly supported and integrated (without making the student feel alone towards a situation-stimulus).

The use of new technologies represents a stimulus but also and above all a challenge for the teacher as he must guarantee the student, through their conscious use, compensation for skills that are lacking or to be integrated. To achieve this, the student must develop compensatory competence (see paragraph 3) through the support of the teacher and classmates.

On the one hand, it is necessary to consider the relationship between teacher and student. The teacher helps the student not only for the messages he/she transmits, but above all for the relationship he/she establishes with him/her, aimed at arousing reactions that have a positive influence on learning. The student, in turn, learns and develops knowledge to the extent that, by responding to the messages, he/she provokes reactions that influence the teaching in a positive sense. The teacher and the pupil, therefore, in communication establish a process of mutual self-training between them. This determines the possibility for the teacher to identify new indicators that could replace or supplement those already prepared.

On the other hand, it is necessary to consider the relationship between the student and classmates. A relationship that can have positive outcomes, when the ability to understand the emotions of each individual student develops. Emotion plays an important role in the quality of learning: if in fact it is from these that the behavior of students in class starts, albeit unconsciously, it is on these that the teacher will have to leverage, through the adoption of a empathic approach and a teaching based on affectivity.

These considerations must help the teacher to reflect on the importance of knowing the students who make up a class, before being able to design the learning process. Process that must be based on the concept of inclusion [25]. Tending towards inclusion and empathy therefore means that the teacher must commit to working on their own cognitive schemes in order to be able to look and implement practices that include various diversities.

The use of technologies can only be effective if the dyslexic student achieves a certain autonomy in their use thanks to the help of the teacher and classmates. Autonomy that will allow him to improve his/her approach to social life.

6 Conclusions

This study focused on the importance for the teacher of knowing how to insert technological tools in the learning process to support dyslexic (and not dyslexic) students. The ideal would be to include them in a "compensatory teaching" that includes a teaching activity that can take into account the different individual learning styles and can thus promote an effective and adequate study method.

Epistemological conceptions lead teachers, often unconsciously, to inadequate teaching practices that put the student in difficulty with a very strenuous personal learning that distances him/her from the learning process.

A set of indicators was presented to support the design of the learning process. The training intervention should allow the development of compensatory skills based not only on the knowledge of the use of technological tools but also on the emotional-motivational components: attitudes that ensure that the tools are effectively seen as an opportunity for redemption, a resource on which the student knows he has to invest time and energy to achieve valid goals.

The proposed indicators are intended to be an example, a support for the teacher. Educational technologies are constantly evolving and it is difficult to say how they will develop and what results they will have on learning processes, especially how the overall training system will be transformed.

It is too early to hypothesize standard rules for the teaching/learning context. Firstly, it is necessary to gain experience; secondly, it is necessary to have a realistic representation of the new framework and its tendencies; finally, it will be possible to regulate.

What is necessary for a dyslexic student to learn is not to know the practical utility of technological tools, but the knowledge that the ability to use these tools will unfold a world of wonderful experiences and allow him/her to become the protagonist of his/her learning process.

The challenge that the dyslexic student asks the teacher to overcome is to have the courage to defend those who are different (despite their diversity being invisible) and to make this diversity a wealth for the class through acceptance and sharing.

References

1. Elbeheri, G.: Motivating Students with Dyslexia: 100 Ideas for Empowering teachers in the Classroom. Routledge (2020)
2. Wang, R., Chen, L., Solheim, I.: Modeling dyslexic students' motivation for enhanced learning in e-learning systems. ACM Trans. Interact. Intell. Syst. **10**(3)(Article 21), 34 (2020). https://doi.org/10.1145/3341197
3. Deci, E.L.: Effects of externally mediated rewards on intrinsic motivation. J. Pers. Soc. Psychol. **18**, 105–115 (1971)
4. Kanter, A.S., Damiani, M.L., Ferri, B.A.: The right to inclusive education under international law: following Italy's lead. J. Int. Special Needs Educ. **17**(1), 21–32 (2015)
5. Fennell, J.: Dewey on rousseau: natural development as the aim of education. J. Educ. Thought (JET)/Revue de La Pensée Éducative **13**(2), 109–120 (1979)
6. Colvin, R.A., King, K.M.: Dewey's educational heritage: the influence of Pestalozzi. J. Philos. History Educ. **68**(1), 45–54 (2018)
7. Falloon, G.: From digital literacy to digital competence: the teacher digital competency (TDC) framework. Educ. Tech. Res. Dev. **68**(5), 2449–2472 (2020). https://doi.org/10.1007/s11423-020-09767-4
8. Hatcher, J., Snowling, M.J., Griffiths, Y.M.: Cognitive assessment of dyslexic students in higher education. British J. Educ. Psychol. **72**, 119–133 (2002)
9. Ventura, M.D.: Between research and action: the generative sense of technology. In: Rønningsbakk, L., Wu, T.-T., Sandnes, F.E., Huang, Y.-M. (eds.) ICITL 2019. LNCS, vol. 11937, pp. 754–763. Springer, Cham (2019). https://doi.org/10.1007/978-3-030-35343-8_78
10. Hulme, C., Snowling, M.J.: Reading disorders and dyslexia. Curr. Opin. Pediatr. **28**, 731–735 (2016). https://doi.org/10.1097/MOP.0000000000000411
11. Lara-Díaz, M.F., Mateus-Moreno, A., Beltrán-Rojas, J.C.: Reading and oral language skills in children with developmental language disorder: influence of socioeconomic, educational, and family variables. Front. Psychol. **12**, 718988 (2021). https://doi.org/10.3389/fpsyg.2021.718988
12. Gibby-Leversuch, R., Hartwell, B.K., Wright, S.: Dyslexia, literacy difficulties and the self-perceptions of children and young people: a systematic review. Curr. Psychol. **40**(11), 5595–5612 (2019). https://doi.org/10.1007/s12144-019-00444-1
13. Arishi, L., Boyle, C., Lauchlan, F.: Inclusive education and the politics of difference: considering the effectiveness of labelling in special education. Educ. Child Psychol. **34**(4), 9–19 (2017)
14. Elliott, J.G., Grigorenko, E.L.: The Dyslexia Debate (No. 14). Cambridge University Press, New York (2014). https://doi.org/10.1017/CBO9781139017824
15. Mruk, C.J.J.: Self-Esteem Research, Theory, and Practice: Toward a Positive Psychology of Self-Esteem, 3rd edn. Springer, New York (2006). https://ebookcentral.proquest.com/lib/soton-ebooks/detail.action?docID=291344
16. Nation, K., Snowling, M.J.: Individual differences in contextual facilitation: evidence from dyslexia and poor reading comprehension. Child Dev. **69**(4), 996–1011 (1998). https://doi.org/10.1111/j.1467-8624.1998.tb06157.x
17. Embley, C.G.: Coming forward to learn: compensatory approaches and remedial instruction integration for adults with dyslexia. J. Thought **53**(1 & 2), 55–72 (2019). https://www.jstor.org/stable/26727285
18. Fogarolo, F., Scapin, C.: Competenze compensative: Tecnologie e strategie per l'autonomia scolastica degli alunni con dislessia e altri DSA, Trento, Erickson (2010)
19. Meneghetti, C., De Beni, R., Cornoldi, C.: Strategic knowledge and consistency in students with good and poor study skills. Eur. J. Cogn. Psychol. **19**(4–5), 628–649 (2007)

20. Ullman, M.T., Pullman, M.Y.: A compensatory role for declarative memory in neurodevelopmental disorders. Neurosci. Biobehav. Rev. **51**, 205–222 (2015). https://doi.org/10.1016/j.neubiorev.2015.01.008
21. Frith, U., Snowling, M.: Reading for meaning and reading for sound in autistic and dyslexic children. Br. J. Dev. Psychol. **1**(4), 329–342 (1983). https://doi.org/10.1111/j.2044-835X.1983.tb00906.x
22. Galita, W.: Compensatory and learning strategies of CIT students: tools in improving listening abilities. Open Access Library J. **2**, 1–7 (2015). https://doi.org/10.4236/oalib.1101405
23. Della Ventura, M.: Creating inspiring learning environments by means of digital technologies: a case study of the effectiveness of whatsapp in music education. EAI Endorsed Trans. e-Learn. **4**, 1–9 (2017). https://doi.org/10.4108/eai.26-7-2017.152906
24. Della Ventura, M.: Twitter as a music education tool to enhance the learning process: conversation analysis. In: Deng, L., Ma, W.W.K., Fong, C.W.R. (eds.) New Media for Educational Change. ECTY, pp. 81–88. Springer, Singapore (2018). https://doi.org/10.1007/978-981-10-8896-4_7
25. d'Alonzo, L.: La gestione della classe per l'inclusione, Scholé 2020 (2020)