AASCIT | American Association for Science and Technology

Blurred Schools: Convergent Methods for Divergent Students

Eduardo Dopico

Department Education Sciences, University of Oviedo, Asturias, Spain

Email address

dopicoeduardo@uniovi.es

Citation

Abstract

Teacher-training programs contributes to improve and update teaching knowledge. They help to contrast one's own educational practices with new didactic approaches and open perspectives that allow teachers to develop teaching dynamics in line with the challenges posed by digital students. It is not a difficult task: our daily experience teaches us that operating with a machine interconnected to a network expands the range of options for preparing and presenting learning contents. But if we reflect on the contents we teach, we´ll see that these do not move away too much from the analogical contents. Concerned to improve their teaching methods, 86 teachers from 31 different educational centers, took part in a sociocritical dynamic to discuss how they teach and to find out how their pupils learn nowadays. In the obtained conclusions the relationship between multimedia students and divergent thinking was established, as were its links to creativity. The need to acquire new educational competencies to develop active teaching-learning methodologies consistent with the profile of students and teachers in the network society also become evident.

1. Introduction

The teacher is the only student who remains in the classroom once the pupils leave. We have to continue studying, improving our skills, updating our knowledge. We are always at school. The students arrive every schoolyear, are with us for a few months and then disappear to continue with their lives. We stay; we must keep learning how to teach better. This is why teacher-training programs are so important. The knowledge we have now will be questioned tomorrow when we expand our field of vision with new scientific advances [1]. Continuing teachers' training programs are not, evidently, a learning of recipes or tricks to implement teaching-learning strategies [2]. It is necessary to see them as a constant adaptation to the evolution of the knowledge of which our students represent the immediate referent; as a permanent commitment in the face of the shared responsibility between the teacher who teaches to learn and the student who learns to learn [3]. Improving our teaching competence every day makes us better teachers.

Teaching to learn is not easy. The teaching styles [4], the way in which knowledge is transmitted, have teach and performing in classroom, are related to the prevalent idea of education in each historical moment. Well immersed in the XXIst century, what is our idea of education now? The answer will depend on the educational theoretical frame where we want to place ourselves. Classical pedagogical schemes recommended directing the design of educational proposals according to the participants [5]. In space 2.0 the digitization of the media and educational resources proposes to organize them according to the knowledge we teach [6], of the competences that our students have to master [7] or of the qualification they must really demonstrate [8]. As teachers, we need

to teach to develop competencies, we need to put into practice a teaching that provides knowledge so that students can apply in a creative, flexible and responsible way the knowledge, skills and attitudes that each specific situation requires. The teaching procedures based on classical literacy (reading and comprehension of texts and written information) no longer provide digital students with the skills required in the 21st century [9]. The current world demands an education based not on a specific student profile but on the changing needs around the environment in which he/she exists as such.

Our daily classroom experience teaches us that operating with a machine interconnected to a network where digitized information circulates allows us many options to design and present teaching-learning contents in a simple and persuasive way. Information and Communication Technologies (ICT) can contribute to universal access to education, to equity in education, to offer quality education, to the professional development of teachers and to the management of a more efficient education [10]. But we are interested in uncovering the model of learning that ICT proposes to know how our students learn from them. We can experience their potential in class through the organization of interactive groups to take advantage of the diversity of intelligences that are present in the classroom [11], but it is imperative to understand how our students approach the knowledge. We can check every day how the adaptability of the technological instruments used as pedagogical resources facilitates the rationalization of educational work [12], but from a didactic point of view we will need to fix the interdependence between teaching and learning styles [13]. Therefore, we need to rethink the educational offer in order to adapt it to the ways of receiving information that our pupils have nowadays. Only on this basis will we be able to focus the contents we teach to the learning style most related to them.

Knowledge is information gained through introspection, experience or learning; it is linked to social praxis, to action [14]. Knowledge is sensitive in the appreciation of the possession of multiple interrelated data that by themselves possess less qualitative value. With logical reasoning we can methodically deal with these data; reasoning is the ability to spontaneously combine two or more separate or isolated experiences to conform a new one in order to obtain a result [15]. All of these capabilities are inherent to Homo sapiens. Another of our capacities is to be able to think with both sides of the brain: the left side solves algorithmic problems (those with a fixed solution; like a subtraction, for example) that are solved by applying a rule; the right side is concerned with heuristic problems, whose answers must be invented because there are none available (a good example is the tendency to think that the best tweet is the viral tweet). We humans have the ability to perceive the nuances of the reality around us and make decisions accordingly.

To guide decision-making, heuristic reasoning [16] explains, on a practical level, how people arrive at a judgment or solve a problem through creativity and lateral thinking [17] or divergent thinking [18]. Applied to

pedagogy it proposes simple and efficient rules using semantic elements in virtual training environments [19]. Through divergent thinking, creativity can take the form of inventing or discovering objects and techniques, of finding new solutions by modifying habitual points of view or of renewing old thought patterns. Guilford and Hoepfner [20] classified productive thinking into two classes: *convergent thinking* (linear), which moves looking for a specific or conventional response and finds a unique solution to the problem; and *divergent thinking* (lateral), which moves in several directions searching for the best solution to solve problems without maintaining established resolution standards, being in this way able to handle several suitable solutions at once instead of finding a single and correct one. To summarize: convergent thinking is thinking oriented to the conventional solution of a problem; divergent thinking is the thought that elaborates criteria of originality, inventiveness and flexibility. This last mode seems to be the model of thinking prevalent in virtual environments [21].

Divergent thinking can be a mental process or a method used to generate creative ideas by exploring many possible solutions; it is related to associative and intuitive thinking [22]. By itself, it is not enough to make creativity effective; it must be associated with mental flexibility. Just as for Ulysses the most important feature of a journey is that it is long [23], the really original thing of creative thinking is the prior process to find viable solutions, the ability to use the information stored in the memory in a new and different way. This implies flexibility of thought [24]. Creativity does not occur within the minds of people, but is a product of the interaction between thoughts and a particular sociocultural context. We tend to think that creativity is a gift that belongs only to a privileged few, but this is a reductionist idea. In the educational framework it is easy to admit that all people have at least a drop of talent, although not all have the strength of will and the desire to work to develop it [25]. Motivation is closely linked to creative production [26]. Intrinsic or internal motivation is fueled by the incentives that lie in the task itself, in the degree of difficulty, in the challenge that it entails; it is an internal mode of motivation that belongs to the person who solves the task (this is the motivation that the students have). Extrinsic motivation, or external, refers to incentives that come from the outside; they do not belong to the task itself nor to the person who solves it (this is the motivation of those who drop out of school).

Convergent / divergent thinking, motivation, creativity, ICT in current teaching-learning processes, were the centers of interest in two non-university teachers training workshops held in 2013 and 2016 at the Faculty of Philosophy of the University of Oviedo (Asturias, Spain). The starting point was to reflect together on the promises of intuitive learning, for instant comprehension, which are a common reference in all technological devices where simplicity in manipulation is sought. Anyone in their fifties who buys a smartphone, an iPad, or any such device knows he/she needs to become familiar with it, read the instructions, test it, and go through a

trial and error phase. None of our students assume such a thing: they turn the device on and immediately operate on it. Information and communication technologies in the educational context have transformed teaching centers [27], and on this topic, the permanent training of teachers is essential. As educators we should be curious about all the educational possibilities offered by virtual learning environments [28]. Technological tools are not just content-update processors indexed in encoded images. Unleash new forms of communication, new learning styles. Accepting such a thing, it remains to see where teachers are and how they approach the teaching processes in their classrooms.

2. Material and Methods

In a workshop-class format, two editions of a continuing education course for teachers (40 hours duration) were carried out (2013 and 2016). A total of 86 teachers from 31 educational centers participated in the courses. They had an average of 23.2 years of teaching experience. There were 65 women and 21 men. Their teaching activity (Figure 1) was carried out at the 4 Children's Schools (12 teachers), 7 Primary Schools (13 teachers), 11 Secondary Education (22 teachers), 6 High Schools (24 teachers) and 3 Vocational Training centers (15 teachers).
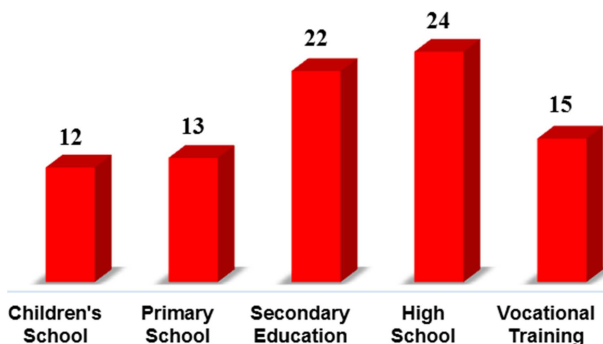

Figure 1. Participating teachers and educational levels.

Teacher' teamwork improves educational practices and promotes continuing education [29]. It allows us to observe critically from outside and from inside what we do in class; questioning us whether this implies some learning gain for our students or if it is an added burden they must endure [30]. Thus, the aim of the course was to become familiar with divergent thinking and, at the same time, the research issue consisted of analyzing in-group the didactic practice itself. Perceptions and teaching experiences expressed by the participants in this course make up the results of this article and offer interesting reflections that can help open educational spaces to discussion.

3. Results and Discussion

Any teaching practice tries to build a learning process in a given context (the school) and at a certain time (the academic schedule) in accordance with the objectives set out both at

the level of a particular subject (the teaching guide), and at the level of the global educational project (the syllabus). This requires a methodology. Teachers choose the most appropriate method to reach the objectives that they intend to achieve with their students. The choice depends on the conception of learning that teachers may have and the role they assign themselves in the teaching-learning process [31]. The best teaching method is, doubtlessly, the method that works**.** None is better than another but, before choosing, we must take into account the levels of cognitive objectives foreseen (competences); the ability of the method to provide autonomous and continuous learning (learn to learn); the degree of control of the students on their own learning (constructivism); the number of students appropriate to the method (one classroom with 15 students works differently than another one with 92); the number of hours of preparation a subject involves (for in-class/out-of-class activities) and the corrections and adaptations that a method requires (meta-evaluation).

Participating teachers were asked to point out the teaching method with which they felt most comfortable, the one that they used more often in their classrooms (Figure 2).
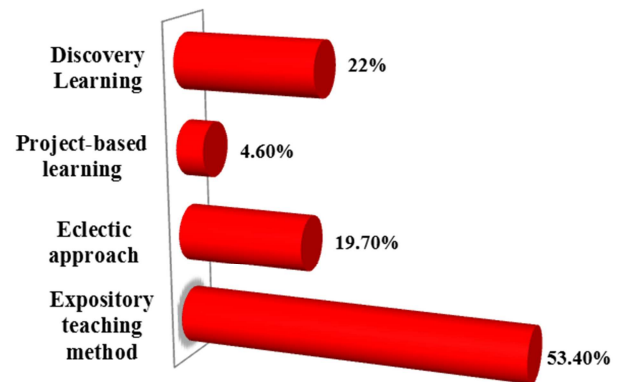

Figure 2. Teaching methods preferred by teachers.

As can be seen, more than a half of the teachers tend to reproduce in their lectures the classic expository model (46 of the teachers present in the course), where only the teacher appropriates the speech in the act of teaching. From a vertical plane, the teacher develops oral summaries of the topics that make up the subjects and the students take care of memorizing them [32]. Of course, none of the teacher-students participating in this study disregarded the exercise of memory as a learning method. They claimed it to the extent of its importance and they noted that learning by heart (rote learning) facilitated the generalization of an effective learning style, in their opinion, characterized by underlining the study book, making a scheme and writing a summary of the lesson.

Slowly but gradually participatory methodologies are entering the classroom giving prominence, in the educational process to those who really have it: students [33]. Examples are *learning by discovery*, through which the teacher invites his/her students to inquire on the topic of the day (19 teachers said they preferred this method); the *eclectic approach,*

which adapts the teaching - learning process to the characteristics of the class and the subject (17 teachers pointed out this method); and the *project-based learning* method (PBL), which is perhaps less used because it is less known to them.

School is the place where knowledge and ignorance collide. In school you learn only the past, the facts already known [34]. In traditional teaching methods, the more events are remembered, the better the marks received by students. Those who fail at school are not interested in the past, maybe because they prefer to think about the future; perhaps they simply do not have a good memory, but this does not mean that they cannot succeed: everyone is able to succeed in some area if precise conditions are given and they have acquired the relevant knowledge and practical skills. Although the concept is still discussed [35], creativity is not an innate talent, it is an environmental capacity and therefore learned. One must expose oneself to creative stimuli, stop to think and question things [36].

Our educational system, based on the logic of industrial society [37], favors the non-creative student (convergent) to the detriment of the creative student (divergent). Teachers are only interested in students answering what is in the content of syllabus. Convergent thinking usually opts for a single solution for each problem [38], in a way that all information has to be ordered and placed correctly to infer the solution. This sort of students easily adapt to the type of work required by the academic apparatus, without questioning its intellectual and pedagogical orientation. This causes the frustration of those students who take risks and who like to improvise. The school routine makes them dare less to think differently for fear of being wrong. As they advance through the school system, students acquire a more rigid and convergent thinking. All these considerations are include in Table 1 where the participating teachers synthesize the differences they perceived between a convergent school that offers all the answers, and a divergent student body that only stops to ask new questions.

Table 1. Convergent school versus Divergent school.

Convergent school
The current school system does very little to encourage creativity
Convergent thinking dominates teaching practice
Students prefer to think in a convergent way because:
1) That is how school tasks are presented to them
2) That is what teachers expect
Divergent school
Students progress faster in digital competence than teachers
The classical methodology changes with the incorporation of young, native digital teachers, trained in ICT with a multimodal language
This is most significant in Mathematics, Language and Geography and History

On this categorization of convergent / divergent thinking and after analyzing how each of them carries out the daily teaching practice and what is the current profile of students in these educational stages, the surveyed teachers agreed on the teacher model that demands divergent didactics in the network society (Table 2).

Table 2. Teacher needs in the network society.

√ A more collaborative and less authoritarian teacher
► More competent in teaching strategies
√ Connects the teaching model to the learning model
► More competent in social skills
√ Addresses cultural diversity
► Has more training in ICT
√ More dynamic and open to innovations
► Makes an effective continuous assessment
√ Develops more cooperative and group work with other teachers

The model drawn is based more on the competences that participants in the continuing training course think they need than on the skills they already have. This profile expresses the shared demand of continuous teacher training for improving their communicative, didactic, social, digital. capacities. It is a stimulus to continue optimizing the professional role, to continue learning and to not lose track of a student body that is constantly evolving.

4. Conclusions

There is widespread consensus that the development of any country depends on the quality of its educational programs [39] [40]. Also about that computers and Internet are especially useful to improve the participation, performance and competence of students in learning tasks [41] [42]. Here we have seen some of the educational implications of all this, in the ways of teaching manifested by the teachers who work in the classroom and in the legitimate desire to understand the models of learning developed by the didactic dimension of multimedia learning. When participants in this research pondered upon the changes produced in educational models from their own professional experience, they recognized a lack. In fact, the word they repeat most is that they need more: more social skills, more teaching strategies, more cooperation, more ICT training, more innovation. They recognized their training gaps but also the scarcity in the economic resources destined to education. Likewise, they expressed the need to lower the teacher / students ratio to offer quality teaching. Everyone recognizes that an excessive number of students drives teachers to despair and discourages them from developing new methodologies. What does the school have to do to offer an educational model compatible with our current students? According to the consensus reached by these 86 teachers, it would be desirable to adapt the teaching criteria to the student. Their experience in educational practice reveals to them that in small groups with individualized attention, students learn more and are more motivated

Learning is not imposed from outside, it is always constructed [43] [44]. We learn to face the difficulties of existence, to address problems and solve them by making the right decisions. Learning involves adaptation to the demands of the environment, acquisition of new behaviors [45] and relatively permanent changes in behavior. In its educational meaning, learning is a product of teaching. Kolb [46] described the *learning cycle* based on experience pointing out

that every learning process is a cycle that starts from one's own experience and ends with a practice that is again a source of experience which favors a new reflection [47]. If the teaching experience is convergent, as revealed by the teachers participating in this research, the resulting learning will be extremely weak, liquid [48]. In the opposite direction, teaching strategies aimed at facilitating meaningful learning in school [49], require starting from the student's experiential culture (what he/she already knows and how he/she obtained that knowledge) to build a shared knowledge space in the classroom [50]. This type of learning implies the effective incorporation into the student's mental structure of contents that become part of their comprehensive memory. Thus, learning, in divergent didactics, means understanding the educational reality as polychromatic. A divergent teaching style presents different options to address educational events; focuses on concepts, procedures and attitudes from new perspectives; and enables students to inquire into the widest variety of possible routes and to find multiple ways to reach workable solutions.

References

[1] Blömeke, S. & Delaney, S. (2012). Assessment of teacher knowledge across countries: A review of the state of research. ZDM 44 (3), 223-247.

[2] Gorozidis, G., & Papaioannou, A. G. (2014). Teachers' motivation to participate in training and to implement innovations. Teaching and Teacher Education, 39, 1-11.

[3] Brookfield, S. D. (2017). Becoming a critically reflective teacher. UK: John Wiley & Sons.

[4] Leask, M. (2013). Teaching styles. Learning to Teach in the Secondary School: A Companion to School Experience. 6th edn, Abingdon, Oxon: Routledge, 345-359.

[5] Carr, W. & Kemmis, S. (1986). Becoming Critical: Education, Knowledge and Action Research. Lewes, Sussex: Falmer Press.

[6] Morrison, K., & Camargo-Borges, C. (2016). The Opportunities and Challenges of Using Digital Learning Environments in Educational Organizations. In: A. Montgomery & I. Kehoe, (Eds.). *Reimagining the Purpose of Schools and Educational Organisations* (pp. 161-172). Switzerland: Springer International Publishing.

[7] Léger, M. T., & Freiman, V. (2016). A narrative approach to understanding the development and retention of digital skills over time in former middle school students, a decade after having used one-to-one laptop computers. Journal of Research on Technology in Education, 48 (1), 57-66.

[8] Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Gebhardt, E. (2014). Preparing for life in a digital age. Wiesbaden: Springer-Verlag.

[9] Wilson, C. (2012). Media and Information Literacy: Pedagogy and Possibilities. Comunicar, 39 (XX). 15-24. Available at: http://www.revistacomunicar.com/pdf/comunicar39.pdf

[10] Unesco (2011). Media and Information Literacy Curriculum for Teachers. Unesco: Paris. Available at: http://unesdoc.unesco.org/images/0019/001929/192971e.pdf

[11] Aubert, A., Flecha, A., García, C., Flecha, R. & Racionero, S. (2011). Aprendizaje dialógico en la sociedad de la información. [Dialogical learning in the information society]. Barcelona: Hipatia.

[12] Beetham, H., & Sharpe, R. (2013). Rethinking pedagogy for a digital age: Designing for 21st century learning. New York: Routledge.

[13] Tyner, K. (2014). Literacy in a digital world: Teaching and learning in the age of information. New York: Routledge.

[14] Vygotsky, L. (1986). Thought and Language. Cambridge, Massachusetts: Mit University Press Group Ltd. 2nd Revised edition.

[15] Walton, D. N. (1990). Practical reasoning. UK: John Wiley & Sons.

[16] Ippoliti, E. (Ed.). (2015). Heuristic reasoning. Swizerland: Springer.

[17] De Bono, E. (2015). Serious Creativity: How to be creative under pressure and turn ideas into action. Canada: Random House.

[18] Robinson, K. (2010). Changing education paradigms. RSA Animate, The Royal Society of Arts, London. Available at: http://www.youtube.com/watch.

[19] Gawthrop, R. (2016). Politics Practice Pedagogy Art. Performance Research, 21 (6), 37-43.

[20] Guilford, J. P., & Hoepfner, R. (1971). The Analysis of Intelligence. Nueva York: McGraw-Hill.

[21] Doron, E. (2016). Short Term Intervention Model for Enhancing Divergent Thinking among School Aged Children. Creativity Research Journal, 28 (3), 372-378.

[22] Pétervári, J., Osman, M., & Bhattacharyan J. (2016). The Role of Intuition in the Generation and Evaluation Stages of Creativity. Frontiers in Psychology, 7 (1420). Doi: 10.3389/fpsyg.2016.01420.

[23] Cavafy, C. P. (2009). Collected Poems. New York: Alfred A. Knopf.

[24] Barak, M., & Levenberg, A. (2016). A model of flexible thinking in contemporary education. Thinking Skills and Creativity, *22*, 74-85.

[25] Kemp, K. (2016). How have I come to recognise and develop my talents which are my gift to my colleagues and pupils. Gifted Education International, 32 (1), 39-53.

[26] De Jesus, S. N., Rus, C. L., Lens, W., & Imaginário, S. (2013). Intrinsic motivation and creativity related to product: A meta-analysis of the studies published between 1990–2010. Creativity Research Journal, 25 (1), 80-84.

[27] Tyner, K. (2009). Literacy in a digital world: Teaching and learning in the age of information. New York: Routledge.

[28] Dopico, E. y Fernández-Urquiza, M. (2012). Learning: Protagoras's Computer. Creative Education, 3 (8). DOI: 10.4236/ce.2012.38190.

[29] Vangrieken, K., Dochy, F., Raes, E., & Kyndt, E. (2015). Teacher collaboration: A systematic review. Educational Research Review, 15, 17-40.

[30] Darling-Hammond, L. (2017). Teacher education around the world: What can we learn from international practice?. European Journal of Teacher Education, 1-19.

[31] Arends, R. (2015). Learning to teach. New York: McGraw-Hill Higher Education.

[32] Mayer, R. E. (2004). Should there be a three-strikes rule against pure discovery learning?. American psychologist, 59 (1), 14.

[33] Loyens, S. M., Jones, S. H., Mikkers, J., & van Gog, T. (2015). Problem-based learning as a facilitator of conceptual change. Learning and Instruction, 38, 34-42.

[34] Westheimer, J. (2015). What did you learn in school today? Music education, democracy, and social justice. In: C. Benedict, P. K. Schmidt, G. Spruce & P. Woodford (Ed) *The Oxford Handbook of Social Justice in Music Education*. New York: Oxford University Press.

[35] Ericsson, K. A. (2014). The road to excellence: The acquisition of expert performance in the arts and sciences, sports, and games. Ney York: Psychology Press.

[36] Harris, A. (2016*). Creativity and Education. London: Springer.

[37] Aparici, R. & Silva, M. (2012). Pedagogy of Interactivity. Comunicar, 38. Doi: http://dx.doi.org/10.3916/C38-2012-02-05

[38] Lubart, T. (2016). Creativity and convergent thinking: reflections, connections and practical considerations. RUDN Journal of Psychology and Pedagogics, (4), 7-15.

[39] Barro, R. J. (2013). Education and economic growth. Annals of Economics and Finance, 14 (2), 301-328.

[40] Delgado, M. S., Henderson, D. J., & Parmeter, C. F. (2014). Does education matter for economic growth? Oxford Bulletin of Economics and Statistics, 76 (3), 334-359.

[41] Gibson, P. A., Stringer, K., Cotten, S. R., Simoni, Z., O'neal, L. J., & Howell-Moroney, M. (2014). Changing teachers, changing students? The impact of a teacher-focused intervention on students' computer usage, attitudes, and anxiety. Computers & Education, 71, 165-174.

[42] McKnight, K., O'Malley, K., Ruzic, R., Horsley, M. K., Franey, J. J., & Bassett, K. (2016). Teaching in a digital age: How educators use technology to improve student learning. Journal of Research on Technology in Education, 48 (3), 194-211.

[43] Fosnot, C. T. (2013). Constructivism: Theory, perspectives, and practice. New York: Teachers College Press.

[44] Daniels, H. (2016). Vygotsky and pedagogy. London: Routledge.

[45] Staddon, J. E. (2016). Adaptive behavior and learning. Cambridge University Press.

[46] Kolb, D. A. (2014). Experiential learning: Experience as the source of learning and development. New Jersey: Pearsons Education.

[47] Bergsteiner, H., & Avery, G. C. (2014). The twin-cycle experiential learning model: reconceptualising Kolb's theory. Studies in Continuing Education, 36 (3), 257-274.

[48] Bauman, Z. (2013). Liquid modernity. New Jersey: John Wiley & Sons.

[49] Kuh, G. D. (2016). Making Learning Meaningful: Engaging Students in Ways That Matter to Them. New Directions for Teaching and Learning, 2016 (145), 49-56.

[50] Edwards, D., & Mercer, N. (2013). Common knowledge: The development of understanding in the classroom. New York: Routledge.