

Jürgen Oelkers

How to Define and Justify Scientific Literacy for Everyone

„Fauste est un dissolu“

(La Bruyère)

The question of my lecture has two sides which seems to be equally difficult, the *definition* and the *justification* of "scientific literacy". A further difficulty arises from the addition "for everyone". If literally *every* person - every woman, every man, every child - should be "scientifically literate" then each one of them should also be asked democratically to consent to this idea. One could say "yes" or "no", I *want* „scientific literacy“ and I do *not* want - but how would this have to be done in the case of *educational* processes which are *not* based on simple decisions and are unforeseeable at the beginning. How can one decide in educational matters when you do not yet know what these matters are? And if coercion should be exerted, what use will it have if there is no consent on the side of the learners?

I will not really answer these questions. The *definition* of what I will say comes at the end of the lecture, I begin with the *refutation* of what is called „scientific literacy“ and will then discuss the *justification*. The refutation has the charme of a tabula-rasa-argument: what would education be *without any* "scientific literacy"? The question requires a strong criticism which paradoxically is older than its object. "Laissons à l'enfance l'exercice de la liberté naturelle" ROUSSEAU wrote in the second book of *Emile* in order to explain the opposition against his stimulant and rival JOHN LOCKE (O.C. IV/p. 316). ROUSSEAU wrote that LOCKE supported the great but wrong maxim that education should to be equated with reasonable dealing with children - "raisonner avec les enfans" (ibid, p. 317). But of all the capabilities of the human mind reason developed the latest. Furthermore „reason“ is complex and full of preconditions. People who rely on reason - let alone scientific reason - in the bringing up of children start with the end: if children were already reasonable there would be no need to bring them up. If one talk to them in the language of reason and therefore in the language of science then one will create incomprehension for the children and disturb their world (ibid).

After this ROUSSEAU proposed a famous - and very grave - distinction: Reason is the reason of *grown-ups* as is science. Childhood has its *own* way of seeing, thinking and feeling, nothing would be more wrong than to force the nature of grown-ups (la manière des hommes) upon children (ibid, p. 319). This sentence has been a momentous mortgage for the following theory of education because it resulted in the didactic rule that the first education should only be submitted to the necessity of nature (ibid, p. 320) and not to the culture of knowledge. Scientific education, a project of the 19th century school history, could be applied to everyone except children and young people.

In the fourth book of the *Emile* which is dedicated to the teaching of reason ROUSSEAU criticized the educational world of books: "Toujours des livres! Quelle manie" (ibid, p. 620). Europe looked like fixed on books without considering that the world could

do without them. There are better regions for education which are not affected by scientific literacy. Here children live more traditionally, closer to nature and unbothered by foreign learning or by theory. Those who want to bring up children need no books except *one* "c'est celui de la nature" (ibid, p. 624). Not theories, knowledge or ideas of science are to teach children and young people, but "les vrais rapports des choses...à la place d'un homme isolé" (ibid, p. 455).

ROUSSEAU takes *Robinson Crusoe* as an example because it corresponds to the basic situation of insular education. This book is the only book which Emile - "un élève imaginaire" (ibid, p. 264) - gets to read. Emile serves as a model by which education *itself* is to be demonstrated. And this paradigm for natural learning reads as follows: Do not show anything to a child which it does not want to see. Humanity is foreign to the child as well as the state of man (l'état de l'homme) which it will only have reached when it has overcome the state of the child (l'état d'enfant) (ibid, p. 453). The greatest care of education must be to keep everything away from the mind of a child which goes beyond its capacity ("qui ne sont pas à sa portée"). The wrong ambition of the fathers made the children slaves of their prejudices (ibid, p. 458) which are always connected with ambitious educational programmes, whereas the happy child plays with time without being its slave (ibid, p. 459). School education and above all the ambitious teaching of scientific reason cuts down the time of children, constrains them and yet has no essential result which would correspond to the nature of children.

This theory has continuously cast a long shadow on the development of education and the school system which in the 19th and 20th century was constantly being criticized for operating *against* the nature of children and for demanding unacceptable strains which were harmful to the mind and health of children and young people. Since LORINSER (1836) the German key word for this is "Ueberbürdung" (over-burdening) and describes the damage which can be caused by scientific education if it is unsuitable for children or goes against their nature. The suspicion was soon confirmed empirically (evidence of this in OELKERS 1996), the school was blamed for all kinds of evils from damaged posture to defects of mind and soul if and because it had a scientific curriculum and offered standardized education for *everyone*. In Europe (almost everywhere) this was organized by the state and ordered by the school-administration, not by democratic procedures. Since the beginning of the 19th century there has never been a vote on the legality of scientific education in schools, but during this time scientific education has been a continuous target of public criticism.

What is so scandalous about this? ROUSSEAU who was not sentimental believed in natural development and that the great topics and aims of education could be distinguished according to different ages: "Employez la force avec les enfans et la raison avec les hommes; tel est l'ordre naturel: le sage n'a pas besoin de loix" (O.C. IV/p. 320). Children are of course not savages who *first* develop strength and *then* reason. Insofar educational offers like scientific literacy cannot be premature, only unsuitable. All critics of modern school however - up to PIAGET (OELKERS 1996a) - assume the *natural order* and also that school in its standard form *contradicts* this order. Insofar ROUSSEAU is omnipresent at least in certain variants of school criticism which up to this day demands that *child centeredness* and so the "nature" of the child should be the decisive standard for the development of the curriculum (DARLING 1994, p. 106cc.)

This is astonishing because ROUSSEAU's *critics* had pointed out the paradoxical and forced constructions of the *Citoyen de Genève* almost immediately after the publication of *Emile* in 1762. In the discussion on *éducation publique* in France, the first historical con-

cept of *scientific education for everyone*, ROUSSEAU'S natural education hardly plays a role (LELIÈVRE 1990). "M.R. (Monsieur Rousseau) ne connoit pas les enfants" SAMUEL FORMEY wrote (1763, p. 98) as a final comment on the short, intense and excluding debate on *Emile*. Ignorance cannot be the destiny of man and even less the result of education (ibid, p. 102), it is nonsensical and dangerous to exclude all knowledge which has been accumulated for centuries from education only to do justice to the nature of the child which is a fiction anyway. FORMEY concludes that ROUSSEAU'S wonderful education in accordance to nature reduces itself to a fatuous and fatal game which would cause irreparable losses especially in the most precious time of learning (ibid, p. 105).

But does this imply that the nature of the child can be *neglected*? It is more likely that the problem is insoluble: depending on the respective data the one or the other side is always right, the school criticism can reproach education with overload (Ueberbürdung) and can stand up for nature, and scientific education can point out the losses which occur if the nature of the child is too much in the centre of attention. The discussion on *child-centered education* in the twenties is an example of this as well as the discussion after "A Nation at Risk" in the eighties. DEWEY'S argument with MAYNARD HUTCHINS has no other topic (KIMBALL 1995, p. 68cc), and also today the models of effective schools are marked by this structure of discourse. As there are hardly any reliable long-term studies on the impact or the effectiveness of the school system each side can rely on suitable data. Depending on the respective point of view the necessity *and* the criticism of scientific education are equally plausible *and* unpalatable, as long as the discussion follows the structure which was mainly marked by ROUSSEAU and his enemies.

Evidence *against* this is possible and advisable: In 1927 THEODOR LITT formulated a central destination for the German education which misses the problem ("Führen oder Wachsenlassen?" - guide or let grow?) because neither the nature of the child nor the superiority of the educator can be tenable assumptions of the theory. In this way it is merely a copy of the popular language of education (OELKERS 1997) which limits the problem dramatically by reducing it to *only two* sides of which the "dialectics" drag on for ever. One can (or may!) never decide whether one should "guide" more or whether one should let nature grow. To conclude with DEWEY: Dangerous or harmful for the theory is the *dualism* not the one or the other side. We would only have *two* sides and so we miss the many sides of education. Furthermore the two sides are often connected with misleading theories of education, the concept of effective *influence* (on the "soul" or the "mind" of the child) and the model of the natural *development*. Both sides are misleading because they either strengthen illusions of the effect of education or they suggest that one should refrain from this business altogether (OELKERS 1994). Education is supposed to be capable of *everything* or *nothing*, it receives the strongest encouragement and goes through the most difficult crisis immediately afterwards simply because it does not know how to discipline its language.

Scientific education, however, cannot simply be read through the *language of education* as ISRAEL SCHEFFLER (1960) described it, i.e. with slogans and metaphors which - so to speak - define the tribes of educational discourse that are unable or even unwilling and incapable to learn from the other side. So we have „parties“ and the communication of loyalty, an endless playing of theoretical ping-pong and by this the missing of the problem. The language of education avoids all difficulty exactly by articulating „pedagogical“ views like that of ROUSSEAU and his mostly uninvited followers. In this way „scientific education“ cannot refer to „pedagogy“ if that means short-sited, reductive and neat models of thinking which represent „misinformation in mini-research“ as GEORGE KNELLER (1993, p. 173) puts it.

The legitimation problem of *scientific education* is related at least to three questions which arise independently of the language of education.

(I) *Can there be* „scientific education“ for everyone or is the concept a typical illusion of the 18th century?

(II) If we have good reasons for „scientific education“ is the concept *valid in general*, really for „everybody“ or must it be divided?

(III) If „scientific education“ is valid in general does it constitute the *core* of education or only *marginal* parts?

The first question goes back to the simple expectation that ignorance can be overcome by education, a topic which was discussed in many treatises on education in the 18th century. In his theory on *instruction publique* LE MERCIER DE LA RIVIÈRE wrote in 1776 that ignorance is the obvious source of all errors, close to illusion and tempting because of its simplifications (MERCIER DE LA RIVIÈRE 1776, p. 21c.), and therefore ignorance is a danger to the state; the common interest could not be articulated publicly because arguments were not understood and therefore not exchanged (ibid, p. 37), so a rational state had to do everything to fight against barbaric ignorance. "Pour agir comme des êtres intelligents & raisonnables, il faut donc qu'on nous facilite l'aquisition (des) connoissances" (ibid. p. 38). This way public education is synonymous with scientific education, because only scientific rationality can fight against superstition, magic and political esotericism (or esoteric politics).

In *this* sense sciences should educate: only they can contribute to a sufficient understanding of reality (including the political order) (*ordre publique*: ibid, p. 42cc.) and can provide "premieres vérités" (ibid, p. 56). In principle no one can be excluded from these truths and therefore scientific education must be assumed to be *public* and *general*, free of censorship and available to everyone. Today - more than 200 years later - there are two aspects which make this argument difficult: the claim of truth and the assertion of progress. LE MERCIER DE LA RIVIÈRE thought that *ignorance* must be seen as the *childhood* of man (ibid, p. 21), the beginning which must be overcome at any rate. There is no right or claim to *ignorance*, but also no right or claim to wrong or other than scientific truths. Science which devalues and drives out all other systems of knowledge decides about truth and nontruth. Scientific education has a monopoly as a precondition, this has made it strong in the past and at the same time caused today's difficulties.

There are still some arguments which support the political justification of the 18th century, mainly arguments of the liberal theory of the public. But there is a preliminary question which is more decisive, i.e. whether "scientific education" can be something of a *concept* when "science" has become a process of unforeseeable differentiation and specialization the results of which interest only a small specialist public. Why should *as many people as possible* study physics or biology or any discipline if public understanding becomes more and more difficult and if no benefit for everyday life is connected with it? The theory of education usually requires a very rare interest „for the sake of itself“ which cannot be generalized. Most learners expect profits beyond the training of faculties or the mere knowledge of theories and facts.

To add one more point: In a sense modern science has become unreliable or at least unfavorable for school-teaching because it cannot offer any concluding results and the corpus of knowledge simultaneously expands and becomes antiquated faster and faster. How can "scientific literacy" develop from this? Obviously the sciences themselves are the deci-

sive obstacle for their didactics: Those who learn something as laymen or novices are in danger only get to know what they can and must quickly forget without getting a guarantee for a direct let alone a life-long profit.

The second question depends on these preliminary decisions: a general concept of scientific education must be assumed in the ideal for *everyone equally*. Individual interests would have to be subjected to the concept, there cannot be free choices, at least not in the sense that everyone can decide according to his intuitions what is best for him or her. The concept *must* exclude that gender or race or culture become a decisive criterion and it must also exclude that radically different alternatives of knowledge like esotericism, shaman belief or theosophy can be chosen at the same level *independently* of scientific criticism and *besides* scientific education. Whether one could choose astrophysics or astrology as a subject would not depend on the curriculum but on the free choice of consumers and one would be free to even decide *against any* education.

This is the view of liberal economy not of political liberalism. Scientific education will lose its core, all offers in the curriculum will be offers for target groups, those who do not chose science cannot or may not be prosecuted for assumptions of losses. But a major part of the justification is based on this argument: something very important *must* be missing if scientific knowledge is *not* accessible to grown-ups or if it is lost underway. What marks these persons would be *ignorance*, like in the 18th century, the lack which comes from *missing* education, and no one should be free to choose this. All compensation programmes - *What every American - every Swiss - Needs to Know* - are based on this mechanism. But is it admissible? Can we prescribe scientific education because of higher reasons and what would these reasons be?

The third question is based on this preliminary decision: scientific education can only be in the centre of every curriculum of "modern schools" if the rivals have been reduced or excluded for good reasons. If the reasons are missing then the concept itself may be reduced: more and more students obviously decide against natural sciences if they have the possibility to choose. Why should they learn what is of no interest to them? And why should they be *forced* to learn (even with gentle didactics), if the motivation is missing and therefore the success will be meager in the average?

Other offers may seem to be more attractive, they may demand less time and energy, they may lead to a greater personal benefit and can *still* be included in human education. The old question of RICHARD PETERS why *not* "bingo, bridge and billiards" (PETERS 1966, p. 144) is dramatically renewed when the contrasts or the dualisms are less clear i.e. when learning effects - education in any cognitive sense - can be expected from activities which do *not* correspond to the canon of scientific or even only humanistic education. Who is interested in billiards is not only involved in a game but at the same time has to do with cultural history, emotive and cognitive standards *and pleasure* which is rather the exception with the typical school subjects.

On the other hand, should higher learning take place *without* the scientific canon and should schools only offer what clients demand? Since THORNDIKE "motivation" is the key to progressive education, but there is a decisive catch, a hitch in this argument, without real understanding and so a process of learning motivation remains superficial, one would react to psychological propaganda which can act without precondition. The problem of choice should therefore be distinguished from the justification of the content, scientific knowledge and method, which obviously should and cannot be left to beginners - learners before the beginning of teaching or just consumers. Knowledge, at least in a downward sense, has

didactic structures for novices, it must be learned in one or the other systematic way and this learnability finally decides about the continuation of every science, therefore no one will expect beginners to have competences which can only develop in the process. Their "motivation" cannot decide on the *offer*; to mention a distant example, one cannot simply say good-bye to classical Latin just because no one at the moment chooses the subject.

But which arguments go beyond ROUSSEAU and the natural education (now understood as a natural *motivation*)? Like JOHN RAWLS (1993) I can see at least *one* good argument and that is public reason (ibid, p. 212cc.) which should guide public education. What RAWLS calls "fair equality of opportunity in education" (ibid, p. 184) does not only contain the aspect of free and equal access to the educational institutions, but relates to the central justification of scientific education itself. It does not merely serve the personality of the learner but - in strong contrast with ROUSSEAU - it serves the responsibility and competence of the future citizen (ibid, p. 185), who has to learn to take part in public affairs. This requires *more* than intuition or everyday knowledge, i.e. understanding or *scientific literacy* in a broad and liberal sense.

To illustrate this RAWLS chooses the following example: members of religious sects usually demand total educational authority over their children. They want to have complete control over the learning-environment in order to fix the children to the belief of the sect. This way they withhold important knowledge from them, everything which contradicts the belief of the sect is condemned. Consequently the children are not capable of becoming "fully cooperating members of society" (ibid, p. 199). They have no knowledge which is publicly accessible and offered by educational institutions and which allows a broad learning experience and opens up further possibilities. This can only be done with suitable knowledge, knowledge that is liberal in itself, whereas all sects must use dogmatic knowledge that is considered to be outside learning.

According to RAWLS one can (or must) object that the theory is connected with the effect that children are educated „to a comprehensive liberal conception“ (ibid.). „Comprehensive doctrines“, for Rawls, are the „background culture“ of civil society (ibid. P. 14) but are still doctrines. Citizens must learn more than the „culture of daily life“ (ibid), they must be capable of control over public affairs and this requires learning of science in an open society. Sects must indoctrinate, they must do everything to avoid transparency. Politics and science are doing the same very often, but they can be controlled by better learning and better understanding even from the outside of power.

Insofar the basic legitimation of the 18th century remains: scientific education does not define itself through the benefit for personal happiness or the effect on certain professions but through the continuous preparation of new generations for public affairs. Because modern societies can only rule their public with the help of far-reaching scientific programmes citizens are incapable of understanding policy and society, i.e. of producing transparency if they are kept ignorant. *Because* of science they are *not* free with regard to their own ignorance or modern society will not have citizens who must learn their roles and competences.

Scientific education contains further justifications, e.g. as a basis for certain professions or for university studies. However, these justifications do not need to be generalized for *everyone*. They can be understood in a particular or functional sense without having to bother the public. But if a *general* school programme should in fact be justified then an argument must appear which points beyond the standards of certain groups and can be used

in an *unspecific* way, as in the Enlightenment in view of "everyone" who can and may not be put in concrete terms.

But is this democratic? And can scientific education be justified only with the truth-monopoly of science which in the view of the critics can hardly be used as a guarantee for paternal education? Science is *ethically, gender-specifically* and *socially* a movement and a power which is as privileged as it is monopolistic, speaking with ROUSSEAU it is a project of the male, white and intellectual Europe in the 17th and 18th century which has excluded all other groups and all former epochs; what could then elevate "science" to a general educational programme?

Two further difficulties arise, even those people who, *against* ROUSSEAU, have a positive attitude towards sciences, are not capable of identifying *education* with *science* and they cannot equate *reason* with *scientific reason*. Scientific literacy does *not* include essential areas of human education, it is mainly cognitive, it has high and excluding standards of understanding and it is bound to learning requirements which are alien to other areas of education like e.g. music or art. If neither the reason of music nor the reason of moral decisions depend on sciences, how can then *scientific literacy* become a must for everyone?

In "The Quest of Certainty" written in 1929 JOHN DEWEY formulated a decisive *advantage*: scientific research is the only method which excludes *certainty* and makes truth temporary. Even political criticism of science must keep up error-free positions, usually positions of morals, it must articulate interests and insofar it cannot be applied to general theories of education. The experimental method to which DEWEY refers must also be distinguished from the various self-assertations of science, e.g. the idea of *being value-free* which represents a moral certainty and must therefore be excluded from criticism as often as possible even though and because there is much doubt about this idea and even more discussion. If there are options for *scientific literacy* then primarily because of the method and not because of any theory of science. DEWEY said: "The road from a perceptible experience which is blind, obscure, fragmentary, meagre in meaning, to objects of sense which are also objects which satisfy, reward and feed intelligence is through ideas that are experimental and operative" (Later Works/4 p. 134).

There is a decisive objection against this transferring of the logics and experiences of research to processes of *scientific literacy*. DEWEY assumes the researcher who is capable of acting but has to be educated first. Or in other words, the *method* of science cannot simply be identical with its *teachability*, and the teachability of science has at least two aspects, the recruitment of the new generation of academics for research, and the conveying of knowledge to the interested public. DEWEY describes the ideal *final case*, not the one of the beginner, and he defines the experiences of the *researcher*, not the ones of the *citizen*. When the researcher is not identical with the citizen then there is a general problem. What ISRAEL SCHEFFLER (1991) described as *cognitive emotions* of scientific research, i.e. curiosity, joys of discovering, the excitement of open knowledge, does not also determine - at least not completely - the attitude of the citizen towards processes of public understanding in which sciences are *also* - but not exclusively - involved.

Citizens must be capable not only of knowing and learning, but also of *opposing* to science when the dependence on experts increases and general problems are no longer being discerned because of specialization and the jargon of specialists. At the same time citizens must find out trivial contents which in media societies are often related to "scientific information". The demands are paradoxical, one must be able to devaluate what one uses, or a piece of knowledge can be true and false at the same time depending on the

respective didactic presentation. Scientific literacy would then be equally adaptive and critical and that goes especially for the didactic forms: learning in school must include the transparency of the mistakes and errors not just the facts.

Insofar a *broad* definition which does not confuse scientific *literacy* with scientific *research* is recommended. We are faced with the risk, that the whole justification of "scientific literacy" is meant merely for the future experts and does not strive for a general use. If one wants to avoid this then *school subjects* cannot simply be correlated with *scientific disciplines*, the intentions and profits of scientific learning must be made transparent *for* everyone not just for special interests, and the effects and errors of teaching should be held under the control of empirical research. The tricky problem of choosing does not come up then, the status of a citizen cannot be chosen in a democratic society nor can the education for this status. This, on the other hand, is no argument for inflexible school structures or the mere call for tradition in teaching.

These have been the preliminary remarks. After these remarks I can give my definition: "Scientific literacy" - if we have to use that term - may be defined as a qualitatively sufficient introduction into various areas of knowledge which are closely associated with scientific research without being identical with it. The expression "literacy" is related to learning processes which are to contribute decisively to the differentiation of mostly cognitive capabilities. In a generalizing way I call it "understanding" (OELKERS 1986) without identifying education as a whole with it. Scientific literacy is an important part of human education which holds its position due to the demands of modern societies which are led by science. These demands also implicate criticism, not merely competence.

If we speak in terms of a didactic ideal we can say: a person is "scientifically literate" if it has sufficient knowledge about areas and methods of science and has autonomous accesses or judgements. "Sufficient" knowledge requires the mastering of standards with which one can demonstrate that and how the status of a beginner has been overcome. The condition of quality distinguishes literacy from demands of dilettants. The differentiation is related to the *lower* level, *towards the top* every education is open. The standards of didactic teaching determine minima of understanding, maxima cannot be determined because of the open learning processes.

In this sense scientific literacy is *not* the same as school curricula. The definition does not justify the curriculum or the canon of traditional lecturing. It refers to a relation between knowledge and learning which allows various forms of organization. Furthermore the definition is not limited to certain ages, it has a broad knowledge condition and does not favour certain sciences against others as the curricula traditionally do. It is not only a question of physics, mathematics and biology, and it is neither a question of learning textbooks on these and similar subjects, scientific literacy only makes sense, if the structure of knowledge, the method for the production of knowledge and the connections between discovering and utilizing are also imparted, i.e. positive science, its methods *and* its criticism.

As long as schools are autonomous and do not work like educational markets there is a chance that science teaching develop in this direction. However this requires that *school knowledge* loses its pedantic character and that it is able to learn the uncertainty of science without ever becoming research itself. But there is an even stronger point: What one can probably learn the most from the process of science is the experimental and disciplined approximation to truths which are in the near future all being overtaken. The temporariness of the "right", the continuous postponing of concluding statements, the increase of knowledge and, to quote KARL POPPER, the detailed work on bold conjectures only in order to

produce even bolder ones, the process of *theoretical curiosity* (I cannot avoid mentioning HANS BLUMENBERG here) connected with strict limitations of "true" statements, if anything can give us information on rational learning methods in modern societies, it is this.

In the average school experience these insights have no or only small effects. Boring textbooks or reductive learning methods deter or discourage learners, but often the resistance comes from somewhere else, the rejection of conceptual abstractions which go beyond everyday language. Abstract theories which ultimately refuse uneducated and unwilling contemplation are in fact the core of modern science. It is not easy to have. And this probably even limits the liberal argument that scientific literacy is a basic equipment of the citizen without which he cannot participate politically. The liberal argument does *not* say *how far* the understanding of science must go, if a participation can be attained *without* Higher Learning, and when one has learnt *too much* in school, quite apart from the problem that one forgets what is not in use. If I do not want to refute myself, which can be quite amusing sometimes, I must conclude differently. For this purpose I go back to the beginning: The researcher ROUSSEAU (not the pedagogue) concludes the introduction to his dictionary of botany with a remark that refers to the didactic basic problem of *scientific literacy* and is therefore suitable for a harmonious ending: who wants to subject himself to the study of nature without having a sufficient description of it (la nomenclature), is bound to end up in the most absurd of all contradictions (O.C.IV/p. 1209):

Literature

- BLUMENBERG, H.: Der Prozess der theoretischen Neugierde. Erweiterte und überarbeitete Neuauflage von „Die Legitimität der Neuzeit“, dritter Teil. Frankfurt/M. 1973.
- DARLING, J.: Child-Centered Education and Its Critics. London: Paul Chapman Publ. 1994.
- DEWEY, J.: The Later Works, 1925-1953. Vol. 4: 1929. Ed. by J.A. BOYDSTON/H. FURST SIMON. Intr. by ST. TOULMIN. Carbondale/Edwardsville: Southern Illinois University Press 1988.
- FORMEY, S.: Anti-Emile. Nouvelle édition corrigée et augmentée. Berlin: Chez Joachim Pauli 1763.
- KIMBALL, B.A. The Condition of American Education/Pragmatism and a Changing Tradition. An Essay with Commentaries and Responses, ed. by R. ORRILL. New York: College Entrance Examination Board 1995.
- KNELLER, G.: Educationists and Their Vanities: One Hundred Missives to My Colleagues. San Francisco/Calif.: Caddo Gap Press 1994.
- LE MERCIER DE LA RIVIERE, P.P.: De l'instruction publique ou considérations morales et politiques sur la nécessité, la nature et la source de cette instruction. Ouvrage demandé pour le ROI DE SUEDE. Stockholm/Francfort sur le Mein: J.L. Eichenberg 1776.
- LELIEVRE, C.: Histoire des institutions scolaires (1789-1989). Ligugé, Poitiers: Nathan 1990.
- LORINSER, K.I.: Zum Schutze der Gesundheit in den Schulen. In: Medicinische Zeitung Jg. V, No. 1 (1836), S. 1-4.
- OELKERS, J.: Verstehen als Bildungsziel. In: N. LUHMANN/K.E. SCHORR (Hrsg.): Zwischen Intransparenz und Verstehen. Fragen an die Pädagogik. Frankfurt/M. 1986, S. 167-218.

- OELKERS, J.: Influence and Development. Two Basic Paradigms of Education. In: *Studies in Philosophy and Education* vol. 13 (1994), S. 91-109.
- OELKERS, J.: *Schulreform und Schulkritik*. Würzburg 1995. (=Erziehung, Schule, Gesellschaft, hrsg. v. W. BÖHM u.a., Bd. 1)
- OELKERS, J.: *Reformpädagogik und Physiologie im 19. Jahrhundert*. Ms. Bern 1996
- OELKERS, J.: *Piaget et l'éducation nouvelle*. In: A.-N. PERRET-CLERMONT/J.-M. BARRELET (éds.): *Jean Piaget et Neuchâtel*. Lausanne: Editions Payot 1996a.
- OELKERS, J.: Is There A „Language of Education“? In: *Studies in Philosophy and Education* vol. 16, no. 1 (1997). (in print)
- PETERS, R.S. *Ethics and Education*. London: George Allen&Unwin 1966
- POPPER, K.: *Conjectures and Refutations. The Growth of Scientific Knowledge*. Third Edition (revised). London: Routledge and Kegan Paul 1969.
- RAWLS, J.: *Political Liberalism*. New York: Columbia University Press 1993.
- ROUSSEAU, J.-J.: *Oeuvres complètes*, éd. B. GAGNEBIN/M. RAYMOND, t. IV: *Emile. Education - Morale - Botanique*. Paris: Editions Gallimard 1969.
- SCHEFFLER, I.: *The Language of Education*. Springfield/III.: Thomas 1960.
- SCHEFFLER, I.: *In Praise of the Cognitive Emotions and other Essays in the Philosophy of Education*. New York/London: Routledge 1991.