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The science(s) of adult education

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This article deals with the problems of forming a scientific system for adult education. The first part contains different concepts of sciences of education in developed countries, with a special emphasis on the difference between pedagogy as 'practical theory' and the sciences of education that can withstand meta-scientific criteria. This is followed by a survey of the educological system of the knowledge of education, and the scientific and non-scientific knowledge of adult education are contrasted. To enable us to distinguish unambiguously between scientific and non-scientific knowledge the survey contains some major criteria for determining whether a discipline is a science or not. In this context andragogy, as well as pedagogy, are defined as 'technological' disciplines with the task of applying the principles discovered by the sciences of adult education: the educational psychology of adults, the sociology of adult education, the economics of adult education and the educational anthropology. In other words, andragogy is the 'praxiology of adult education', i.e. the science of applying scientific knowledge about adult education in the practice of that education. Andragogy could become 'the general science of adult education' and acquire a supra-technological character if it grew into a science of the effectiveness of systems of adult education. In that case andragogy would study the interaction between the elements of the system as well as the interaction between these elements and the subsystems of the educational environment.

Introduction

As is well known, the debate about the subject-matter of the study and scientific constitution of andragogy as an overall science of adult education has been going on ever since it appeared. This debate is particularly intensive in those countries of Continental Europe in which the scientific character of andragogy has been trying primarily to prove its scientific identity in relation to pedagogy, believing that by solving the problem all the other problems will automatically be solved in analogy with its elder sister.

This is evident in the efforts of andragogy to prove the existence of such differences between learning of children and adolescents on the one hand and adults on the other that will guarantee a sufficient difference between the corresponding theories (pedagogy and andragogy). But the fact that experts on adult education to some extent agree that this form of education is in fact different from the education of children and adolescents does not suffice to ensure the scientific legitimacy of andragogy. As a

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successful teaching in order to achieve educational goals derived from the dominant ideology stemming from theology, philosophy or politics. Practical pedagogy does not examine the laws of successful teaching and learning in a certain social, economic and cultural context whose effectiveness is explained and predicted by these laws. Therefore, this discipline is a kind of applied philosophy whose goals it has taken over, and applied psychology that points to the means by which to achieve its goals. Only this form of pedagogy truly exists as an academic discipline in the education of teachers in different countries of the world (Brezinka 1981: 7-25, Giesecke 1991).

However, in Central Europe there has been no lack of authors who have publicly warned about the non-scientific character of pedagogy without ever questioning the justification for its existence. Austrian Otto Willmann speaks of pedagogy as being 'rich in advice and well-wishing' and 'poor in facts' (Willmann 1862: 18). He describes pedagogy as a normative and directive discipline which does not deal with what is but with what ought to be. Pedagogy is not universal but specific for a certain society and its conditions since the values it promotes are different in different societies.

The German Wilhelm Dilthey explains the acceptance of pedagogy by the noble ideas it propagates in the sphere of moral life, happiness, perfection etc. (Dilthey 1888/1924).

The French Emile Durkheim, in his work devoted to pedagogy, clearly defines its nature and the difference between pedagogy as practical theories ('theories pratiques') and as a science of education (la science de l'éducation). Practical theory is a programme of actions for achieving certain goals, while science is the attempt to describe and explain the functioning of the educational system as part of the social system (Durkheim 1922). By advocating a systems and interdisciplinary approach in the study of education as well as the application of psychological and sociological methodology in research, Durkheim can be considered one of the first educologists.

Independently of the above-mentioned authors, the German theorist Rudolf Lochner published the first German text which treats the 'science of education' as an empirical non-normative science (Lochner 1963). He demonstrated, with valid arguments, the non-scientific character of pedagogy as well as the possibility and need for building a scientific theory of education.

It ought to be emphasized that neither Willmann, Durkheim nor Lochner considered practical pedagogy as unnecessary or replaceable by scientific pedagogy. Moreover, they considered practical pedagogy irreplaceable. They only opposed confusing and equating pedagogy with science of education whose development they advocated and which can be achieved by applying scientific methods to problems of education.

In presenting the state of theory of education in the second half of this century Monshouwer's comparative analysis (1981a: 51-86) will be relied on as one of the most systematic analyses of its kind.

The state of the theory of education in the Germanic circle

The pedagogic-philosophical educational tradition of the German circle has definitely influenced the development of 'scientific pedagogy' in the countries that either belong to or were for a longer period of time influenced by German pedagogy. In this area we can discern three courses or streams of development in the theory of education. The *geisteswissenschaftliche school* insists on the separation of pedagogy from psychology and sociology, even when it comes to applying its insights in the practice of education. On

the other hand it insists on linking pedagogy with philosophy (ethics) and on its own specific features. Education is identified with 'good' upbringing, which means that education which is not in line with the governing morals cannot be considered education at all. This is accompanied by an aversion towards measurement and exactitude in investigations.

The critical educational theory covers the range from neo-Marxism, through Habermas's philosophy of science to various humanistic-idealistic-Utopian concepts advocating radical change by means of education: change of the individual (emancipational pedagogy) and change of the society (socialist educational doctrine). It pleads for the linking of pedagogy and politics, which makes the pedagogist a kind of social activist. Philosophy, which is the basis for this pedagogic view, is attributed the status of a science very broadly determined.

The third stream of theorists of education is that of *critical rationalism*. Its major proponents is Wolfgang Brezinka, who supports the application of those methodological criteria in the research on education and in the development of its theory, which are the basis for the development of other social and humanistic sciences. Brezinka (1978) clearly distinguishes the science of education (*Erziehungswissenschaft*) developing according to meta-theoretical scientific criteria from the normative philosophy of education which results in goals in education and practical pedagogy (*'praktische paedagogik'*) which in the English-speaking area is termed 'praxiology of education'. Practical pedagogy is the application of the insights of the educational sciences in achieving the goals of education. Therefore, Brezinka also considers both educational philosophy and practical educational theory necessary but he does not consider them as science. On the other hand he does not consider the science of education as being a particular science separated from the corps of humanistic sciences, neither does he think it possible for this science to have a methodology of its own.

It can be concluded that German pedagogy has the longest educational-theoretical tradition but it has also been exposed to the fiercest criticism for some hundred years now. However, this criticism has produced no significant results. Herbart's idea of 'psychological pedagogy' was followed by Lay (1908) and Meumann (1914) under the title 'experimental pedagogy' and Fisher (1914) and Lochner (1927) under the title 'descriptive pedagogy'. According to Brezinka, this orientation only gave results in modern educational psychology. However, even in this case empirical research in education still needs to be integrated theoretically to prevent dispersion among several different empirical sciences (Scheffler 1966).

The French-speaking area

In the French-speaking area (France and Switzerland) the dominant theorists of education are the psychologists Piaget and Mialaret. The scientific status of pedagogy is not perceived as a separate theoretical or practical problem. Pedagogy was for a long time considered to be applied philosophy and psychology, although Piaget emphasizes that experimental pedagogy cannot be reduced to psychology. At the same time he denies the independence of pedagogy from psychology. He solves this seeming contradiction by an appeal for an interdisciplinary approach to research in education which will ensure a scientific status for experimental pedagogy (Piaget 1971).

On the other hand Mialaret, unlike Piaget, speaks about educational sciences in the plural (Mialaret 1985), stating a whole series of disciplines, whose number is considerably above the number of truly established sciences of education. It is

interesting that economics, physical sciences as a subject and technique communication what makes up in line with the or with the 'practical Piaget, emphasizes disciplinary research which are mainly to do

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matter of fact, any analogy with pedagogy might do more harm than good to andragogy because it would automatically take on all the failings in the scientific constitution of pedagogy.

The author of this paper lives in Croatia, one of the states included in the territory of former Yugoslavia, in which andragogy (in analogy with pedagogy) was strongly advocated as an overall and general science of adult education. However, there is a belief that such a concept of andragogy cannot withstand meta-theoretical evaluation. The same applies to pedagogy as the overall science of the education of children and adolescents. Since scientific questions are supranational, in examining this problem use will be made of available foreign published articles on this question. It should be pointed out that insufficient communication between different languages in this scientific area has affected the dialogue concerning the sciences of education both of the young and adults. Therefore, the fact that Croatians are relatively poorly informed about the relevant scientific positions of different schools of thought in education is an additional aggravating circumstance in the search for a single concept of the science of education or andragogy as a general science of adult education.

Discussion of the problems of the science of adult education should include a definition of the term 'science' itself as well as the criteria by which an area of activity could be considered scientific. Only by means of meta-scientific criteria is it possible to systematize different types of knowledge of adult education and to classify them as scientific and non-scientific, the latter being no less important than the former.

In scientific studies special attention should be paid to the relationship between the existing educational sciences (educational psychology, sociology, economics and anthropology) and pedagogy and andragogy. This relationship will be the main object of analysis.

Owing to the different concepts of educational science in different countries, a concise survey of the dominant ideas will be presented first. This will be followed by presentation of a personal viewpoint on the matter. The major part of the analysis will deal with pedagogy since, where it exists, and because of its pretensions to be 'the general theory of education', pedagogy tries to absorb the problems of adult education, too.

'Practical theory' and science(s) of education

In order to understand the traditional disputes among educational theorists one should distinguish the so-called 'practical theories' ('practical pedagogy', 'practical knowledge' or 'praxicology of education') from scientific theories or sciences of education. It is interesting that even Herbart, the founder of pedagogy, stated that pedagogy is a practical theory and not a science in the strict sense of the word. Along with traditional pedagogy he launched the idea of a scientific theory of education which he called 'psychological pedagogy' (Herbart 1806) since he believed that psychological insights enabled the achievement of educational goals derived from philosophy. At the time, however, scientific psychology of education did not exist (it appeared some hundred years later through research by Thorndike) so that practical pedagogy was the only 'theory' of education for a whole century. This tradition essentially aggravated the later reconceptualization based on educational sciences, developed in the 20th century, mostly after the Second World War. Hence such vast differences in ideas about the theory of education between countries with a pedagogic tradition and those without it.

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interesting that Mialaret distinguishes educational sciences (psychology, sociology, economics, physiology, philosophy, history, ethnology and others) from pedagogic sciences as a subgroup of educational sciences. Pedagogic sciences deal with methods and techniques of teaching, programming and evaluation of education, communication in the educational process and the like. In other words they deal with what makes up the so-called curricular system. This idea of pedagogic sciences is quite in line with the 'practical theory' of education as it is understood in the German circle or with the 'praxiological education' in the American circle. Mialaret, even more than Piaget, emphasizes the need for interdisciplinary research but also the need for intra-disciplinary research by which he wants to point out the singularity of educational research which produces original contributions to sciences of education. These insights are mainly to do with the conditions on which the effectiveness of education depends.

Central and East European area

In the block of Central and Eastern European countries, headed by the former Soviet Union, the educational sciences were found within the framework of Marxist philosophy which was attributed a scientific status not equal to that of other 'ordinary' sciences but, owing to the 'superiority of dialectic-materialistic methods', that of a special 'super science'. However, this was only on the level of declarations. By analysing papers from the 'Congress on the logic, methodology and philosophy of science', which was held every four years, it can be seen that Eastern European Marxists, who were scientifically orientated, used the same methods and approaches to research as their non-Marxist colleagues. Moreover, they lent even more significance than their western colleagues to cybernetics and the application of mathematical methods in the social sciences, in the regulation of social processes and, in analogy with this, in educational science.

However, Soviet pedagogy was of an entirely practical nature and it neither corresponded with Marx's philosophizing nor did it apply the insights of psychology which in some areas were even accepted throughout the world. It was completely impregnated with communist ideology (Josipov and Gončarov 1947, Pazenok 1983, Kaniščenko and Koroleva 1985) and served as a means of political propaganda. Its contribution to world scientific thought in terms of education is negligible but its influence on Central and Eastern European pedagogy after the Second World War was immense. This is evident from a comparative analysis of Soviet and Yugoslav pedagogy textbooks (Goja 1991).

The English-speaking area

In the English-speaking countries (England, the USA, Canada, Australia) there are several different views of the educational science(s). The dominant view is that it is impossible to constitute a single science of education parallel with the existing educational sciences (psychology, sociology, anthropology and economics of education) because these are too different to be framed into one science. It is also impossible to train research workers to master such a vast range of knowledge. Therefore, education can, after all, be a profession but not a single scientific discipline (Peters 1966). Connors, in his well-known book *An Introduction to the Philosophy of Education* supports the view that only psychology and sociology, because of their explanatory force, deserve

scientific status, so that the science of education consists in the application of psychological and sociological insights on 'educational situations'. According to him, the majority of educational 'theories' do not meet scientific criteria because they are burdened with values and do not explain educational reality. Hirst (1966), on the other hand, strongly supports the presence of non-scientific value elements in 'practical theories' without which the practical activity of education is not possible. Despite the fact that this educational theory cannot be considered scientific in the strict sense of the word, he believes that it is a 'theory'.

Within the American philosophy, however, there is a strong stream postulating philosophy as a science and consequently the philosophy of education as the general science of education. This standpoint originated with Dewey who claimed that 'philosophy can even be defined as the general theory of education' (Dewey 1916: 383). True, this triggered years of debate on whether educational philosophy is indeed identical with general philosophy (*Harvard Educational Review* 1956) as well as a debate on the nature of the relationship between the philosophy of education and educational practice (Burns 1962, Perkinson 1964, Guttchen 1966). It can be concluded that Dewey's view caused divergent reactions, from complete acceptance to complete rejection.

Quite a large group of authors (McMurray 1955, Kuethe 1963, Walton 1963, and others) advocate the existence of education as a distinctive discipline which is neither philosophy nor does it consist in the mere application of the insights of educational psychology and sociology to problems of education. The major reason for the existence of such a unique and autonomous science of education is the singularity, complexity and significance of educational activity. Along with this Belth (1962, 1965) emphasizes that a separate science of education cannot be developed as a parallel with psychology, sociology, anthropology and other educational sciences (educational foundations). The task of a single science of education is to investigate elements of education and their interrelations.

The next conception of the theory of education is that of a single but partly applied discipline. It has a large number of supporters whose differences stem from their choice of their favourite fundamental discipline. Some of them take philosophy as the basis but the opposition to this standpoint is very strong. The majority believe that the science of education is simply applied psychology and to a lesser degree applied sociology. The others are in line with Herbart's views of science of education as a combination of the application of both philosophy and psychology.

A smaller but ever influential stream includes those who regard the science of education as a particular scientific discipline which fulfils all the meta-scientific conditions. This enables it to explain, predict and influence educational phenomena. Educational activity is indeed a phenomenon complex and significant enough to justify supporting the application of an authentic scientific approach in this area. This is even more true with regard to the existing results of pedagogy, which has pretended to be the general science of education while at the same time being satisfied with describing phenomena of education and prescribing principles whose application should improve the effectiveness of education. Finally, we are dealing with the critical-rational position of Brezinka in Germany or the educational psychologists and sociologists in various countries.

The scientific development based on this position takes two different directions. One consists in the expansion of the leading educational sciences to spread their research activities over all the major aspects of educational activity. The leaders in this direction are educational psychology and sociology. Psychology has shown more

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The term 'educology' resulting from the 'logos' of education University (USA) enabled the union and education as the true founder Bloomington (USA) Fisher (USA) and *International Journal* further studied as the English-speaking the author of the presents the general questions regarding

Educology is a body of knowledge of education classified according to analytical, normative, *educological knowledge* educational law while *empirical knowledge* *Scientific educology* educational psychology educational anthropology *Praxiology of education* knowledge in the field of knowledge about education carrying out educational research educological research to the education

Figure 1 features and Fisher 1981

The figure shows from the analytical understanding of

success in investigating and explaining the so-called internal effects of education while sociology, whose competitor in this area is educational economics, has had more success in describing and explaining the link between education and the systems of its environment. Despite undoubted scientific successes of this development it cannot be said to have led to the creation of a single, internally consistent integrative theory of an educational system which would also include, interactively linked, elements of the system and their relationship with the environment of education. In this regard, the educological idea has opened up some new perspectives and, owing to its theoretical potential and the fact that it is relatively unfamiliar, this will be presented in more detail.

The educological system of knowledge of education

The term 'educology' is an abbreviation of the term 'EDUCational psychOLOGY', resulting from the belief that educational psychology encompassed the major part of the 'logos' of education. The term was first used by Lowry W. Harding of Ohio State University (USA) in 1951 (Harding 1951) meaning knowledge *about* education. This enabled the uniform terminological distinction between education as a phenomenon and education as knowledge about education, i.e. the theory of education. However, the true founders of educology are Elisabeth Steiner (Maccia) of Indiana University, Bloomington (USA), John Biggs of New Castle University, Australia as well as James Fisher (USA) and James Christensen (Australia), the initiators and editors of the *International Journal of Educology*. In the 1970s and 1980s the educological concept was further studied and spread among the members of the scientific community not only in the English-speaking countries but also in Europe, which can be seen from articles by the author of the book *A View on Education as Educology* (Christensen 1981). The book presents the genesis and structure of the educological concept as well as the main questions regarding its further development.

Educology is trying to encompass, systematize and bring into interrelation all types of knowledge of education, favouring none. The relevant knowledge of education is classified according to the criteria (standards) of verification into three basic groups: analytical, normative and empirical (Christensen and Fisher 1979). *Analytical educological knowledge* consists of analytical philosophy, the history of education and educational law. *Normative educology* consists of a normative philosophy of education while *empirical types of knowledge of education* are classified into scientific and praxiological. *Scientific educology* encompasses the knowledge contained in the educational sciences: educational psychology, educational sociology, the economics of education, educational anthropology, educational politology and physiology of education. *Praxiology of education* encompasses the knowledge about the application of scientific knowledge in the practice of education and political praxiology of education, i.e. the knowledge about the application of scientific knowledge of education in creating and carrying out educational policy. The object of analytic, normative and empirical educological research can be any phenomenon of education: from pre-school education to the education of adults.

Figure 1 features a table showing the educological system (according to Christensen and Fisher 1981: 277).

The figure shows that problems of adult education can and should be investigated from the analytic, normative and empirical points of view in order to reach an overall understanding of the educational phenomenon. These approaches neither exclude nor

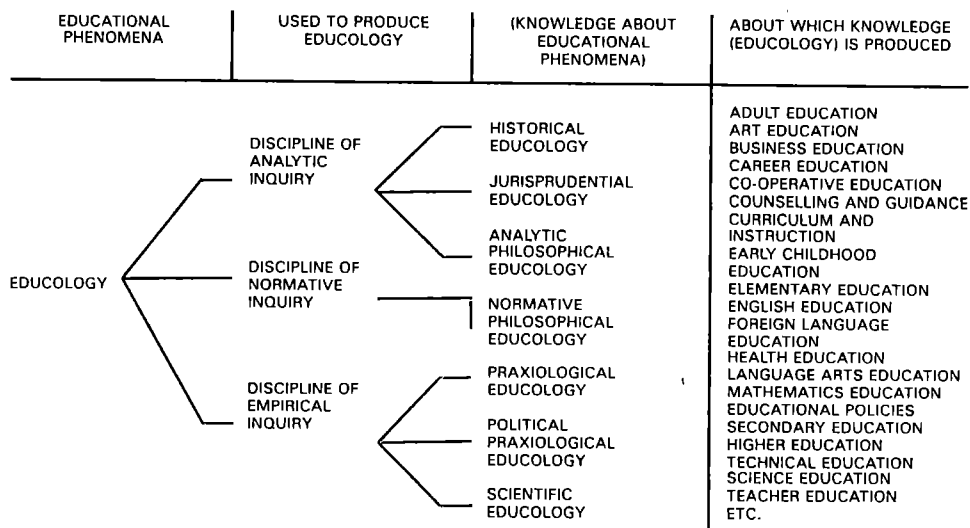


Figure 1. Educology as a fund of knowledge, its subdisciplines, its subfunds and its objects of knowledge.

compete with one another. Any competition among their supporters is therefore counterproductive and does not lead to a broadening of knowledge but to its reduction and simplification. Both non-scientific and scientific knowledge of certain educational phenomena are significant. Therefore, to label something as science for reasons of prestige is certainly unnecessary.

Criteria for determining the scientific character of knowledge

In order to be able to distinguish between scientific and non-scientific knowledge it is necessary to determine the criteria for their distinction. There is no total agreement in the philosophy of science as to the minimum of conditions that must be met for a discipline to be considered a science. There are two basic viewpoints in this regard which could be termed positivistic and postpositivistic (Borg and Gall 1989). According to Anton Monshouwer (1981b: 159-196) the minimal criteria for the scientific status of a discipline are the following five:

- (1) the requirement of *logical consistency*;
- (2) the requirement of *empirical correspondence*;
- (3) the requirement of *explanatory knowledge*;
- (4) the requirement of *exactitude or measurability*;

and finally (logically included in (4), but to avoid misunderstandings nevertheless worth listing separately);

- (5) the requirement of *the absence of value judgements*, in other words, *objectivity*. (Monshouwer 1981b: 165, 166).

The requirement of logical consistency means that a system of claims, and each scientific theory is a system of scientific claims (laws), must not contain logical contradictions. Monshouwer believes that there is a whole series of philosophical and theological

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theories as well as social sciences which do not meet this requirement and cannot, therefore, be considered as scientific in the strict sense of the word.

The requirement of empirical correspondence does not imply that a scientific theory must reflect reality. It implies that all the claims must withstand testing by means of empirical data. Theories based on speculation, whose components may be logically consistent, are not scientific since they do not enable accurate prediction of true events. A large number of educational theories are, partly or entirely, speculative, which is reason enough for not being scientific.

The requirement of explanatory knowledge means that investigation must result in laws which can formulate causal-consecutive relations among the phenomena that can be generalized. Discovered causal relations which do not have a general significance, since they can be applied to a limited number of cases, do not have a scientific but a professional value. Only by means of scientific laws is it possible to explain a phenomenon, to predict it and finally to bring it under control if allowed by the technological, economic or political circumstances. This means that mere describing, defining and classifying of a phenomenon is not a science but it is an indispensable preparatory phase of scientific research. Therefore, descriptive knowledge, taken separately, is not yet scientific.

Exactitude (measurability) of studied phenomena is an indispensable requirement without which it is not possible to check empirically the hypotheses studied, i.e. various theoretical constructs, and thus fulfil condition number 2, scientific character (the requirement of empirical correspondence). For a theoretical construct to be empirically tested it must first be operationalized, i.e. expressed by means of quantifiable and measurable variables. As a result of this requirement numerous philosophical constructs and social theories cannot, at least for the time being, be qualified as scientific.

The absence of value judgement is the most difficult criterion of scientific character when it comes to uniform interpretation. In fact, value orientations do not play the same role in the various phases of selecting a problem to study, carrying out the study, interpreting the study results and in their practical application. The social prestige of a scientific activity shows that it is accepted as something 'good' since it is believed to fulfil numerous human needs. This is why projects of greater applicability are favoured in the financing of research work. Even projects of a fundamental nature are estimated from the point of view of their possible anticipated utility. 'Utility' is evidently a subjective value category, because what is useful for an individual or group does not have to be useful for others. Evidently, it is a matter of a value judgement of a scientific problem, which is inevitable and basically legitimate.

However, we must insist upon the absence of the value component in the phase of performing research and interpreting results, i.e. during the operationalization of variables, their measurement and the testing of research hypotheses. This is achieved by the professional application of research methodology by which the acts of data collecting and processing are as objective and standardized as possible in order to neutralize the effect of the researchers' viewpoints on the results of research. Therefore, a scientific report about some research performed must contain the information which enables the research to be checked by neutral researchers. Such control is also necessary to prevent falsification of results because it enables the revelation of false results. Therefore, when we discuss the question of the so-called ideological neutrality of science, or its allegedly inevitable ideological character, the answer is conditional since it depends on the phase of a research process. The choice of a problem of investigation can be non-scientifically motivated, and which is always the use of

scientific discoveries in human practice and this can in the end be harmful for humanity, but this is not the responsibility of science. But a scientific research process in itself can and must be ideologically neutral. Otherwise it does not have scientific meaning.

Our question is whether it is possible to be objective in investigating the affective effects of education (values, attitudes, habits), i.e. whether it is possible to exclude moral judgement since 'moral' is nothing but a system of moral values that are being tested. The affective qualities can be studied objectively, as is demonstrated by the fund of laws discovered in this way in clinical and social psychology (for instance: phases of moral development studied by Piaget, Kohlberg, Staub and others). Another problem is that either the investigating or the ordering party will tend to examine the selected problem out of non-scientific motives and in the same way use the results in accordance with their individual or some group interest. But it is scientifically unacceptable to consider as bad, if they are true, those results that are not 'good' just because they do not meet the expectations of the researching or the ordering party. This corresponds to the pedagogic idea according to which education that produces unwanted instead of wanted affective results is not considered education at all.

The scientific definition of education as the intentional and organized acting on the personality (psychological structure of a person) should be extra moral so as to encompass all such phenomena; from 'brainwashing' (which has a negative moral connotation) to education and 're-education', which can have either a positive or a negative connotation (depending on the standpoint of the person passing judgement upon the process of 're-education'), or any effect on affective personality traits, which is produced by any form of education, regardless of the goals of that education.

Because of the significance of other types of knowledge that do not meet the scientific criteria mentioned and because of the barriers imposed by these criteria, adherents of numerous other disciplines are attempting to get their disciplines recognized as scientific. This has led to a certain 'softening' of the criteria for scientific status and to a broadening of the term 'science' itself. The advantages and disadvantages of the 'narrower' and stricter conception of science (it can be called S1) on the one hand and of the 'broader' and softer conception of science (S2) on the other are elaborated in papers by European philosophers of science who have studied this problem (Nagel 1961, Hempel 1965, Rudner 1966, Popper 1968, Opp 1970, Brezinka 1978). They can be systematized as follows (according to Monshouwer, 1981b: 168-169):

The advantages of the 'narrower' (S1) concept of science are:

1. an unambiguous definition of the concept of science;
2. a single concept of science (the ideal of a 'unified science', so that the distinction between natural sciences and social sciences is dispensed with);
3. strict logical consistency of scientific theories;
4. absence of value judgements in the research phase (based on a strict segregation of 'context of discovery' and 'context of validation');
5. capacity for checking research and the results of investigation, and thereby a guarantee of possible falsification;
6. an unbreakable connection between explanation, prediction, and technology.

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The disadvantages of the narrower (S1) concept of science are:

1. empirical reality (whatever this may be) is distorted or artificially labeled, insofar as only those characteristics which can be quantitatively investigated are extracted, which means, to put it another way, that an object of research is adapted to the (often fortuitous) available research methods (operationalization);
2. this raises a clear tension between 'objectivity' and 'relevance' (cf. De Groot, 1969, ch. 6);
3. S1 can never claim to reproduce so-called 'objective empirical reality' (whatever this might be).

The advantages of the 'broader' (S2) concept of knowledge are:

1. greater adaptation to the inherent nature of the object of research;
2. the possibility of the use of not purely quantitative, but also qualitative research methods (whatever these may be), assuming no strict segregation of 'context of discovery' and 'context of validation';
3. a greater relationship as regards content between on the one hand the object of research and on the other this same object as it functions in everyday life (in other words, a clearer relationship between science and everyday human praxis).

The disadvantages of the 'broader' (S2) concept of science are:

1. there can be no question of an unambiguous definition of a concept of science, which makes it extremely difficult to say what should and what should not be called 'science';
2. the strict logical consistency of theories is, intentionally or otherwise, made impossible;
3. elements of subjectivity are openly or secretly permitted;
4. there is a wide scope for speculation and thus an absence of means of checking (i.e. amongst other things no possibility of falsification);
5. the possibilities of arriving at a strict explanation (and thereby at prediction and technology) are very limited (although on the other hand S2 can arrive at a fuller interpretation of the phenomena studied).

The advantages and disadvantages of the above-mentioned concepts of science produce a dilemma as to which concept to choose. This dilemma can be solved by means of the criteria of 'scientific pragmatism', according to which each approach is good as long as it results in a greater knowledge of the phenomenon studied. Therefore S1 should be favoured whenever it can be used to carry out an investigation, because it gives more accurate and more easily interpretable results. However, if operationalization and measurement of a construct should lead to over-reduction and over-distortion, owing to the nature of the problem of research, the S2 approach should be selected. This approach enables the establishment of less confident, so-called 'quasi scientific laws', which do not provide entirely satisfactory explanations but do lead to a description of the phenomena and enable at least approximately accurate prediction and some kind of control.

The smaller scientific strength of the S2 concept should not prevent us from making use of its advantages on condition that we keep in mind its limitations in interpreting the results. The means that we must point out the relative hypothetical features of the conclusions and the limited scope of phenomena encompassed by these conclusions.

The application of the S2 concept may gradually lead to methodological progress which will enable a transition to the S1 level of scientific research. Of course, it will never be possible to give scientific answers to metaphysical and moral questions. Naturally, these will remain the objects of non-scientific but none the less significant research.

The praxiology of education as a 'technological' science

In the context of the educological system it is also necessary to determine more precisely the meaning of the term 'praxiology of education'. It is a derivative of the term 'praxis', when means practical action, and the suffix 'logy', which means knowledge about that action. Therefore, praxiology of education implies the knowledge of how to make the educational process (the teaching-learning process) more successful.

Praxiology of education is a significant conceptual link between science, technology and normative philosophy of education. Its object of investigation is how the scientific knowledge of education, which has been discovered in educational sciences and formulated in the form of descriptive and explanatory scientific laws, can be applied in the practice of education in order to achieve goals derived from philosophy or some other system of values. The praxiology of education can be defined as educational technology since 'tehne' or 'technique' originally meant skills, i.e. an effective procedure. Since technology (technique) is often understood as 'hardware', i.e. as the material means of work, it must be emphasized that educational technology encompasses the techniques (methods) of successful teaching which also use material (technological) means such as tape recorders, overhead projectors, cassette recorders, television and so on. The advantage of the term 'praxiology of education' is that it emphasizes the knowledge ('logy') of the practical procedure without the association of technical aids which may or may not be used in the process of teaching-learning, and are not essential for the concept of 'tehne' of education.

The contestable question in the philosophy of science is whether the knowledge of skills (techniques) can constitute a science. Since they represent the application of the laws discovered in fundamental sciences, especially natural sciences, it is thought that they cannot constitute a science. Such types of knowledge, according to this interpretation, can constitute a profession but not a science. Consequently, medicine is not a science, neither are technical disciplines, since they do not lead to the discovery of new laws. They apply already discovered laws to solve certain types of practical problems. Actually, the Nobel prizes for science, even those for medicine, are not awarded to doctors but to biologists, physicists, chemists. However, it is true that both doctors and engineers produce new knowledge (discoveries) in medicine and technology and thereby earn doctoral degrees in medical and technological and not in fundamental sciences.

Where, then, is the difference between scientific and technological discoveries? Regarding the criterion of scientific status, the basic difference is in the scope of phenomena that can be described, explained, predicted and controlled. Fundamental scientific discoveries explain a greater number of phenomena (providing a greater possibility of generalization), while technological ones have a greater application value. All other criteria of scientific character of knowledge, even those of the stricter S1 concept, are met by these disciplines (the criteria of logical consistency, empirical checking, explanatory ability, exactitude measurability and extra-morality). Why then, in analogy with this, can the praxiology of education not be a science, too, though

not a fundament:

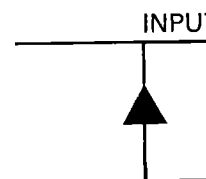
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Monshouwer (1981b) believes that technological disciplines do fulfil the conditions to acquire scientific status according to the S1 criteria but, of course, they must 'earn' this status by an output of real technological innovations, which, in the end, many have achieved. So, for instance, medicine owes its scientific and especially its social respect to its successes in treating people, and technological sciences also by impressive achievements of technology without which contemporary civilization would not be possible.

The praxiology of education can, regarding its object of research, have scientific status but it has to acquire scientific legitimacy by scientific output consisting of discoveries of the manner of application of the laws discovered in educational sciences in the attainment of the goals of education.

Educology: an integrative science of education (theory of educational systems)

Within the debate on the science(s) of education the important question is whether educology offers a single logically consistent systematization of different types of knowledge of education or whether it is also a new supracollective integration of these types of knowledge in the form of a 'single science of education'. It is thus necessary to determine the research object of that science and the features which make that object different from the other educational sciences.

Ever since 1964 Elizabeth Steiner has been developing a holistic approach to the investigation of education by means of an organismic theoretical model. Education is defined as a system consisting of four basic subsystems: teacher, student, curriculum and environment (the context within which education takes place). The system, however, is described by means of a cybernetic model which encompasses the relationships among the elements of education itself and the interaction of education and environment. Figure 2 shows the basic structure of the model (according to Steiner 1981: 114).

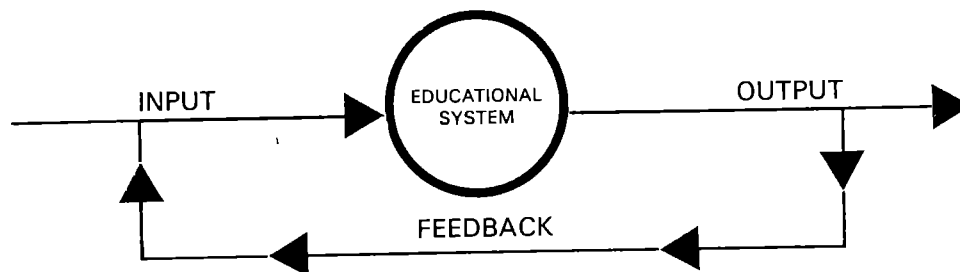


Figure 2. Cybernetic educational theory model.

The difference between the object of educology determined in this way and certain educational sciences (psychology, sociology, anthropology and others) is that it alone encompasses the system of education as a whole, investigating interaction within itself and interaction with the environment. Educational sciences, however, investigate bilateral relations between education on the one hand and psychological, sociological, economic and other variables on the other.

Christensen and Fisher (1981), however, insist on yet another difference between educology and educational sciences. According to them it lies in the fact that educology investigates education as a dependent variable, while educational sciences treat it as an independent one. Educology examines the influence of psychic characteristics of participants in education and the social, economic and cultural factors, having an impact on the educational process. On the other hand, the educational sciences are interested in the impact of education on the participants' personality traits and effects on their behaviour on different sub-systems of the environment.

However, this division is hardly defensible despite the fact that to explain a certain phenomenon (education) means to discover its being conditioned by other phenomena, i.e. that the investigated phenomenon always has the status of a dependent variable. But practical and theoretical interest in education stems from its presumed capacity to act on man and his behaviour. Hence, too, the interest in the investigation of factors of education itself, since education is considered a powerful means of psychological, economic, social, cultural and other changes. The knowledge of these is supposed to provide an impact on education in order to augment its effectiveness in a desired direction. In other words, practically and theoretically, education is interesting primarily as an independent variable, which results in the interest in education as a dependent variable.

Therefore, the educational sciences also determine their subject-matter by investigating education, naturally from the point of view of a specific scientific interest, both as a dependent and as an independent variable. Psychology investigates the effects of learning on certain psychological features (education is an independent variable) but also the effects of some personality traits on learning, which is entirely natural, since both learning and personality traits are psychological categories. Sociology investigates the effects of education on society (education is an independent variable) but also the effects of society on education (education as a dependent variable). The economics of education investigates the economic utility of education (education as an independent variable) but also the effects of financial investment on educational production (education is a dependent variable). Christensen and Fisher do not overlook these facts. But they solve the resulting conceptual problem by placing under the scientific 'umbrella' of educology those parts of the educational sciences that investigate the relationships in which education is a dependent variable, while considering as their authentic subject-matter only those parts of the educational sciences which investigate the effects of education on man and society.

The only indisputable specific trait of educology is its goal towards investigating the interaction of factors that act on education and its effects and the investigation of interactions among internal and external educational effects. *Therefore, both educology and the educational sciences, quite legitimately, investigate education both as a dependent and an independent variable, the difference being in whether they investigate education holistically or analytically (elementaristically).*

Steiner and the other major theorists of educology have not investigated the inter-relationships of education and its environment as fully as the relationships among the elements of the curricular system. They have concentrated their attention on the effects of different psychological and contextual factors on the flow of the educational process. This is evident from works published in the *International Journal of Educology* (eds. Christensen and Fisher). This focus on the processes of teaching and learning brings educology closer to the psychology of education than it might want.

Short (1981) warned that interaction in education ought to be investigated both on the micro and the macro levels, i.e. within the educational system and between

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education and other socialization factors (family, neighbourhood, persons of the same age and others). This connects intentional and unintentional education, which is already a significant broadening of the object of study of educology. Steiner, as Short has warned, too, completely neglected the effect of the phenomena of the running of a school, educational policy, the system of educational institutions, the importance of educational opportunities, problems of educational goals, the social effects of education and other phenomena encompassed by the sphere of the relationship between education and its social (political), economic and cultural environment in which educational work has the status of an independent variable. These relations, it is true, are investigated by educational sociology (politology), educational economics and educational anthropology, i.e. from three different points of view and not by taking the education system as an integral whole and looking at the interaction of different types of educational effects.

It is interesting that scientific logic, according to which a phenomenon must be explained as fully as possible, has initiated the increased educological behaviour of certain educological sciences, which has brought about a spontaneous broadening of the educological transdisciplinary idea beyond nominally educological investigations. What makes them educological is the systems approach to the investigation of educational activity which is today explicitly advocated in the sociology and economics of education and which has long been applied in psychology, too. However, the emphases of their investigations are, naturally, on the aspect of educational activity which corresponds with their mother profession (sociology, economics, psychology) and which guarantees their scientific identity. But, genuine educological investigations are those that emphasize the interactions between factors of education and the effects of education using knowledge from different educational sciences and favouring none. Consequently, we might conclude that the subject of educology, as a distinctive integrative science of education, is the system of education, because a system, by definition, is a group of elements in interaction. Therefore, suggested, *educology is a general theory of educational systems*. Its task is to describe and explain their structure and functioning and on the basis of the discovered laws to project changes in education which can be predicted to produce desired effects.

Andragogy in the educological system

Starting from the definition of science, it can be said that the subject-matter of the science of adult education is research into the laws of adult education with the purpose of explaining its phenomenology and improving its effectiveness. Of course, it is necessary here to keep in mind the definition of education as organized learning. Since intentional education is organized and goal-directed learning, in order to improve its effectiveness a series of actions and means have been applied, which, owing to their interdependence and interconditioning, constitute a system. While the general theory of education (educology) discovers general laws of the effectiveness of educational activity as a whole, *the theory of adult education investigates specific laws of the effectiveness of the system of adult education*. In this context we arrive at the term 'andragogy' which denotes the practice of adult education while pretending to be a term denoting the science of adult education.

By positioning andragogy within the system of knowledge of education we come across some terminological and conceptual problems. The terminological ones stem from the fact that 'andragogy', as a term, is widespread in only some Eastern and

Central European countries, even somewhat less than 'pedagogy'. The local character of the term suggests that this is not a science, since science knows no state borders. But, this is not a decisive criterion, because the same concept can be termed differently in different countries and languages, although scientific terminology is, as a rule, international. In the English-speaking countries, in which all the educational sciences originated and are most highly developed, the term 'andragogy' is hardly used at all, as is also the case with the term 'pedagogy'. However, those who do use the term, like Malcolm Knowles in the most quoted book on adult education (Knowles 1970/1980) use it to denote the 'technology of adult education' which also encompasses the other components of the system of adult education (programmes, technology, institutions, experts, financing, laws). This is also done by other significant publications about adult education including the international encyclopaedia of the lifelong education of adults (Titmus 1989). However, when explaining the phenomenon of adult education they use the concepts of the social and humanistic or educational sciences. This means that, in the educological system, andragogy could have the status of the 'praxiology of education' or 'practical theory' of education if we use Brezinka's terminology, or 'practical knowledge' in terms of Peter Jarvis's concept of practical knowledge (Jarvis 1991: 39).

Peter Jarvis's concept of practical knowledge about education which, in my opinion, corresponds to our concept of andragogy, can be illustrated by the following quotation:

Hence, it is possible to construct a body of knowledge that is about the practice of education of adults and applicable to both adult and continuing education. Once this body of practical knowledge about education has been constructed, it might be called a body of educational knowledge or even a body of adult educational knowledge, etc. Does this, however, mean that education is a discipline, like other social sciences? Response to such a question must be negative. The body of educational knowledge is a body of applied knowledge which is theoretically drawn from the other social sciences. The point about this is that in everyday life actions are performed that, when analysed, fall into the ambit of distinct disciplines - such as psychology or sociology or philosophy.

By using the matrix of the educological system of knowledge of education, different types of knowledge about adult education can be systematized into analytical, normative and empirical types of knowledge about adult education (praxiological and scientific). *The analytic discipline of adult education are:* the history of adult education, 'law of adult education' and analytic philosophy of adult education. *The normative discipline of adult education* is normative philosophy of adult education. The empirical disciplines of adult education are: *the praxiology of adult education* (andragogy) and *the sciences of adult education:* the psychology of adult education, the sociology of adult education, the economics of adult education and the anthropology of adult education.

As demonstrated earlier, technological (praxiological) types of knowledge can also have scientific status (status of applied science) if they produce new knowledge on how to apply the concepts and constructs produced in fundamental sciences in checking the phenomena they investigate. The core of andragogy as an applied science lies in the knowledge of technology of adult education which encompasses the actions and techniques of the development of individual elements of the curricular system.

However, regarding the methodology of research into adult education it must be stated that there is no particular andragogic scientific research methodology. The

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methods and techniques of investigation are those normally used in educational research (Borg and Gall 1989).

Andragogy can also have a supratechnological meaning if it develops as a science of the system of adult education. In that case, however, andragogy is not purely the theory of the application of the educational sciences' cognitions in the practice of adult education. On the contrary, its subject for investigation is broadened to the investigation of the laws of the effectiveness of the system of adult education. In that case it not only investigates the interaction between the elements of the system (programmes, methods, organization), but also the interaction between the system and its environment. In this case andragogy would be the true 'educology of adult education'.

If the problem of the science of adult education is established in this way, the relationship between andragogy and pedagogy seems to be of secondary importance and can productively be solved within the concept of lifelong education. It is understandable that in this case, too, the differences between the education of the young and adults will have to be taken into consideration and must have their respective theoretical reflections. These differences stem from the psychological differences between children and adults in all the features that condition the effectiveness of learning, as well as from the differences between the life circumstances and social roles of the young and adults which determine the content of learning and the conditions in which learning takes place. The psychological differences lie in the abilities, motivation for learning and the relevant foreknowledge, while the sociological differences lie in the social roles and conditions. While the major social role of children and the young is that of learners, adults are at the same time workers, spouses, parents, grown-up children of their aged parents, citizens etc. Therefore, it is easy to understand the development of the psychology and sociology of adult education, whose results are technologically dealt with by andragogy.

Malcolm Knowles was one of the first who clearly articulated the technological implications of the discoveries of the sciences of adult education, believing that the technological particularities of adult education are so large that the subtitle of his book *The Modern Practice of Adult Education* (1970/1980) was *Andragogy Versus Pedagogy*. Debate on the character and degree of these differences is still going on, as is attested by the recent respectable gathering of experts on adult education held in Ljubljana in October 1993 (*Rethinking Adult Education for Development*, 1993). But the science(s) of adult education confirm their identities by the development of fundamental sciences of (adult) education and by the application of their discoveries in the development of a specific technology of adult education and less by opposition to pedagogy. After all, in the major part of the developed world pedagogy does not exist at all.

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