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WHAT IS WRONG WITH CONSTRUCTIVIST TEACHING? ELABORATION, RECAPITULATION AND SYNTHESIS OF THEORETICAL AND HISTORICAL CONTROVERSIES

Abstract: *The aim of this study is to use a historical and theoretical-comparative methodological approach to elaborate and recapitulate the phenomenon, history, theoretical, methodological and didactic characteristics as well as certain controversies of constructivism in education. The emphasis will be placed on observing constructivist teaching in the discourse of the movements of reform pedagogy from a hundred and more years ago. By synthesizing the analyzed facts, one can state with certainty that constructivist teaching is a multiple and robust theoretical concept with its own definitions and a long history. The didactic arrangements of constructivist teaching show roots in the concepts of schools and teaching of the reform pedagogy movement, but these two terms cannot be considered synonymous. Constructivist teaching provides essential educational benefits to students, but there are also well-argued criticisms and limitations whose interpretations depend on the theoretical, epistemological and cultural perspectives of observation.*

Keywords: *constructivism, didactic theories, history of education, reform pedagogy, teaching*

INTRODUCTION

Almost a quarter of a century ago, in his article titled *Constructivism and teaching: A new paradigm in general didactics?* (Germ. *Konstruktivismus und Unterricht. Gibt es einen neuen Ansatz in der Allgemeine Didaktik?*) German pedagogue Ewald Terhart (1999; 2003) stated that after the turbulent 1960s and 1970s marked by lively scientific discussions about didactic models, the

era of curriculum reform and the period of educational catastrophe in Germany (Blankertz, 1969/1974; Gudjons et al. 1992; Hopmann & Riquards, 1995; Terhart, 2002) followed years of calm regarding these disputes. In the early 1990s, international didactic waters were disturbed by the phenomenon of the constructivist paradigm in education, and it brought the old debated to life again – the ones about constructivist teaching, learning and instruction. Since then, an extensive corpus of empirical research and meta-analytic studies has been conducted, and a number of relevant theoretical studies on constructivist teaching have been published (Arnold, 2007; Babić, 2007; Bardman, 1997; Duffy, Lowyck, & Jonassen, 1992; Jonassen, 1991; Jukić, 2013; Kösel, 1997; Merill, 1991; Müller, 1996; Phillips, 1995; Reich, 2012; Siebert, 2005; Simons et al., 2002; Terhart, 1999; Tobias & Duffy, 2009; Terhart, 1999, 2003;Topolovčan, 2015; Topolovčan et al., 2017). Thus appeared the term *constructivist didactics* (Germ. *Konstruktivistische Didaktik*) (Arnold, 2007; Reich, 2012; Siebert, 2005).

It is crucial to emphasize that the concept of constructivism does not have a unique and sole definition. Research, definition, conceptualization and practical application of constructivism are approached from different theoretical perspectives. It is approached from a philosophical (epistemological), psychological (learning theory) and didactic aspect (Simons, et al. 2002; Topolovčan, 2015; Topolovčan et al., 2017). The research focus of this study is the didactic aspect of constructivism. This is not some fad and capriciousness, which is already visible by reviewing the categorizations and discussions about significant didactic models. Thus, studies from the late 1960s (Blankertz, 1969/1974) did not mention the constructivist model of didactics at all, nor did those from the 1980s and 1990s (Gudjons, 1994; Gudjons et al., 1992). However, in later books and editions, constructivism was categorically defined as another great didactic model (Kiper & Mischke, 2008; Kron et al., 2014).

In any case, during that period, constructivist teaching aroused a series of vigorous debates about the definition, originality, history, classification, and theoretical perspectives of this didactic term. All of that resulted in the formation of vigorous advocates, as well as opponents of constructivism in teaching and the emergence of intriguing discussions (e.g., Kirschner et al., 2006; Terhart, 1999, 2003; Tobias & Duffy, 2009). Indeed, the camps of supporters and opponents of a particular theoretical approach to constructivism in teaching took on the characteristics of religious sects (Phillips, 1995). Constructivist teaching has received enormous attention. Especially since there are justified and reasoned criticisms, as well as educational benefits and questions about the originality of the concept (Terhart, 1999, 2003; Tobias & Duffy, 2009). The sectarian debates about constructivist teaching may have somewhat calmed down; however, this didactic theory of teaching certainly continues to attract scholarly attention. Therefore, the limits and possibilities of this didactic model

are still being actively researched (e.g., van Bergen & Parsell, 2019; Funa and Talaue, 2021; Kwan, 2020; Rudić, 2022; Yılmaz et al., 2022).

Therefore, the aim of this study is to elaborate and recapitulate the phenomenon, history, theoretical and methodological perspectives and practicality of constructivist teaching using a theoretical-comparative and historical approach. In this regard, the tasks of this study are to analyze the history of the emergence of constructivism and to critically elaborate the theoretical perspectives of the concept of constructivism in teaching. Furthermore, the task is to analyze ontological and epistemological features of constructivism as well as didactic constructivist teaching arrangements. Additionally, the task is to analyze the theoretical-methodological and pedagogical-didactic advantages and criticisms of constructivist teaching. The theoretical-comparative and historical methodological approach will enable the deconstruction of the genesis and characteristics of constructivist teaching and then, in the discourse of didactic innovations, the theoretical reconstruction of the anatomy of this didactic model. Based on the obtained and discovered scientific facts, this research study will provide insight into the historical development of constructivism in education with special reference to the movements of reform pedagogy.

THEORETICAL-METHODOLOGICAL PERSPECTIVES OF CONSTRUCTIVIST TEACHING

Constructivism in teaching, as a theoretical and practical concept, has many theoretical perspectives and definitions. By abstracting the existing definitions, constructivist learning can be explained as an interpretive and nonlinear, as well as self-regulated, way of constructing knowledge and cognition in an educational context supported by interaction with the social and physical environment (Fosnot & Perry, 2005; Oldfather et al., 1998; Reich, 2012; Siebert, 2005). In other words, based on existing prior knowledge (experience) adding the teaching content and educational activities, the student (co)constructs knowledge, skills and attitudes provided by the given curriculum. He constructs them independently and/or in interaction with other people (teachers, students, parents) or the physical environment and in accordance with the potential of his own cognitive, ethical, aesthetic and physical predispositions. Constructivist teaching is a joint and planned activity between a teacher and students, which enables the aforementioned method of acquiring one's own knowledge, i.e., achieving the desired educational goals of the lesson. Referring to the aforementioned definition, some of the characteristics of constructivist teaching are as follows: 1) teachers pay close attention to students' perspectives, logic, and feelings, 2) the teacher and students are learning and teaching, 3) social interaction permeates the classroom, 4) the curriculum is negotiated among all participants, 5) the curriculum and the physical contents of the classroom

reflect students' interests and are infused with their cultures, 6) students' physical, emotional, and psychological needs are considered along with their intellectual needs, 7) assessment is based on each individual's progression and not exclusively on competitive norms) and 8) a primary goal orientation of the classroom is collaborative meaning construction (Oldfather et al., 1998, p. 22). These characteristics are general. By positioning them in didactic practice, we can see teaching strategies such as cooperative learning, inquiry-based learning, integrative learning, project-based learning, practical learning and problem-based learning as well as learning by doing and play-based learning, which implies individualized teaching and a creative democratic classroom climate (Topolovčan, 2015; Topolovčan et al., 2017). These teaching strategies become concrete by respecting the characteristics of the teaching content in classroom teaching scenarios, as well as in educational activities outside the classroom. This includes the planned execution of experiments in specialized school laboratories, gardens, workshops, studios, extracurricular teaching in nature, individual and/or collaborative projects (project method), practical teaching, artistic and physical activities, experiential literary and historical research and debates, etc.

Alongside didactic constructivism, this term also appears as a scientific paradigm. Therefore, it is evident that constructivism has significant axiological, ontological, epistemological and methodological characteristics. Egon G. Guba and Yvonna C. Lincoln (2005) provided an established categorization of the scientific paradigm. In addition to the positivist, postpositivist and participatory paradigms and the paradigm of critical theory, they also mention the constructivist paradigm. Ontologically and epistemologically, the constructivist paradigm indicates that there is objective reality and knowledge, but it is never fully possible to know them objectively. The cognition of reality and knowledge is only an individual (co)construction that an individual constructs independently or in cooperation with others on the basis of previous knowledge, intellectual and motor abilities and emotional predispositions. The constructivist paradigm defined in this way is in accordance with the definition of constructivism in teaching. Furthermore, three ontological and epistemological rational considerations of constructivism stand out (Phillips, 1995). The first rational question is whether human learning and cognition is an individual or a social (collaborative) construction. This dilemma is most frequently mentioned in the context of constructivism. The question of whether the construction of human knowledge and cognition is entirely individual or whether people (co)construct their knowledge and knowledge in cooperation with other people, i.e., society, lies at the base of this perspective. This differentiation represents the core of the division of constructivism into *radical*, which was largely represented by Ernst von Glasersfeld, and *social*, whose representative is mainly considered to be Lev Vygotsky. Another rationale is the question of whether constructed

cognition and knowledge belong to creation or discovery. This very question implies the dilemma of whether what man knows is the complete creation of new knowledge or just the discovery of what exists in nature. The third rationale is the question of whether learning and cognition are intellectual or physical constructions. At the basis of this lies the question of whether the acquisition of knowledge is a product of physical or intellectual human activity. This established the differentiation of cognitive constructivism or pragmatism represented by William James and John Dewey.

There are also several variants of constructivism. This indicates cognitive, personal, moderate, radical and social constructivism (Topolovčan et al., 2017). Regardless of how conceptually and epistemologically the definitions of cognitive, personal or moderate constructivism differ (Topolovčan et al., 2017), these variants can be categorized into the differentiation of radical and social constructivism (Topolovčan, 2015, 2016; Topolovčan & Matijević, 2016; Topolovčan et al., 2017). The theory of radical constructivism indicates that knowledge is individually constructed. Representatives of this theoretical variant of constructivism are Ernst von Glasersfeld and Jean Piaget (Topolovčan, 2015, 2016; Topolovčan & Matijević, 2016; Topolovčan et al., 2017; von Glasersfeld, 2003). On the other hand, social constructivism indicates that an individual constructs his own knowledge by interacting with other people. That is, the individual knowledge of an individual is in its essence a social construction. Lev Vygotsky is considered a representative of social constructivism, even though he never labeled himself a constructivist (Langford, 2005; Topolovčan, 2015, 2016; Topolovčan et al., 2017).

By elaborating constructivism in teaching, it became clear that the main premise that practically establishes constructivism in the educational context is a shift from the traditional emphasis on the process of *instruction* to the process of *learning*. This separates the process of learning from the process of instruction. Learning and instruction are established as separate frames of reference that can be explored separately. The manifestation of this differentiation lies in the realization that it is possible to learn in the circumstances of instruction (teaching process), it is possible to instruct without anyone learning anything, it is possible to learn independently (autodidactic, self-regulated learning, informal learning) and it is also possible to learn something that is not explicitly taught (hidden curriculum). This is a repercussion of the psychologization of education, where the *philosophy of education* is replaced with the *psychology* of education, and *teaching* is replaced with *learning* (Autio, 2017).

In the last forty years, alongside the development of the psychological constructivist approach to learning, theories of teaching have developed something called a *new learning* or a *new culture of learning* (Germ. *Neue Lernkultur*) (Heuer et al., 2001; Rodek, 2011; Simons et al., 2002). Elaborating on what is "new" in the new culture of learning, one can see how this novelty

refers to the shift from the emphasis from the instruction process to the learning process. Apart from the fact that constructivism represents an immanent element of the new learning culture, it has its origins in the formation of the original concept of *innovative learning* in the late 1970s thanks to the ideas of James W. Botkin, Mahdi Elmandjra and Mircea Malitza (1979). A crucial feature of innovative learning is the focus on the future and learning as creating novelties (creativity). Based on researching ecological studies, sociology, anthropology and cognitive and developmental psychology, James W. Botkin, Mahdi Elmandjra and Mircea Malitza (1979) formed the concept, definition and manifest forms of innovative learning. Innovative learning is based on the premise that the essence of human learning lies not in the learning of something already familiar but in the creation of novelties and new future-oriented cognitions. Innovative learning anticipates a shift from adaptive, individual, national, teaching-led and school-based learning and learning at a young age toward flexible, participatory, complex, collaborative, extracurricular, lifelong, anticipatory, social and global learning (Rodek, 2011). The characteristics of innovative learning are integral elements of constructivist learning and teaching, where learning is both a *process* and a *result* of that process. The new culture of learning implies new educational objectives of teaching, new teaching strategies and new learning strategies (Simons et al., 2002). In the context of the new learning culture*, a new learning environment* is being researched as its synonym (Könings et al., 2008). The new learning environment is also called a *powerful learning environment – PLE* (De Corte et al., 2003; Könings et al., 2005; Könings et al., 2008). A powerful learning environment promotes the acquisition of metacognitive knowledge, problem-solving skills, self-regulated learning and practical application of knowledge (De Corte et al., 2003; Könings et al., 2005). These represent integral elements of constructivist learning as a process and result of such learning.

Elaborating on the theoretical aspects of constructivism in teaching, it is necessary to mention some features of the questionnaires of empirical research on constructivist teaching. One of the most commonly used questionnaires for researching constructivist teaching is the *Constructivist learning environment survey* - *CLES*, constructed by Barry J. Fraser together with Darrell L. Fisher and Peter C. Taylor, and other colleagues, which they then applied to various curriculum circumstances (e.g., Kim, Fisher and Fraser, 2006; Taylor, Fraser, & Fisher, 1997; Taylor, Fraser, & White, 1994). Although constructivist teaching is connected to the constructivist scientific paradigm (Guba & Lincoln, 2005), and thus with the axiological, ontological, epistemological and methodological characteristics of that paradigm, this instrument was constructed in the domain of quantitative methodology. The Constructivist learning environment survey was developed by Barry J. Fraser and his colleagues based on research on the construct and application of the *Learning environment inventory* from

the end of the 1970s and during the 1980s. It was developed simultaneously with the development of the *Classroom environment scale,* which was dealt with by Rudolf Moos and his colleagues in the 1970s (Kim, Fisher, & Fraser, 2006). Constructivist learning environment survey - CLES measures five latent dimensions of constructivist teaching and consists of approximately 30 manifest statements (the number of particles varies with over 40 statements, depending on the version of the questionnaire used). However, as a rule, all individual latent dimensions of the questionnaire have an equal number of statements. The latent dimensions measured by the questionnaire are *personal relevance*, which examines the student's perception of the importance of what is being learned; *uncertainty*, which measures the relativity of what is being learned; *critical voice*, which is aimed at critically reflecting on what is being learned; *shared control*, which is aimed at assessing the control of one's own learning and agreement with teachers about the process of one's own learning; and *student negotiation*, which is aimed at researching collaborative learning. This questionnaire has been used frequently in the last thirty years, and it shows exceptional metric characteristics. The advantage of this questionnaire is its applicability for examining constructivist teaching in different subjects (e.g., Chemistry, Physics, Sociology, etc.). The survey was initially constructed in English, but over the past few decades of use, it has been translated into numerous languages (e.g., Kim et al., 2006; Kwan, 2019) and has been applied in different countries, including Croatia (e.g., Bošnjak, 2009; Matijević et al., 2017; Rudić, 2022; Topolovčan, 2015; Topolovčan & Matijević, 2016, 2017; Topolovčan et al., 2016; Topolovčan et al., 2017). International comparative studies comparing constructivist teaching were conducted based on this questionnaire (e.g., Aldrige et al., 2000). The fact that during several decades of application, this questionnaire has not lost its relevance and has also been used in recent research on constructivist teaching (e.g., Kwan, 2020; Rudić, 2022; Yılmaz et al., 2022) shows how high-quality and methodologically appropriate this survey is. For the purposes of researching a new (powerful) learning environment, the *Inventory of Perceived Study Environment-Extended - IPSEE* (Könings et al., 2008) was constructed. This instrument measures five latent dimensions of the new (powerful) learning environment: 1) fascinating content, 2) productive learning, 3) student autonomy, 4) interaction (cooperation with students and the teacher) and 5) clarity of goals. This instrument was constructed according to the *Inventory of Perceived Study Environment - IPSE* (Wierstra et al., 1999). It is interesting to note that the latter instrument was constructed according to the model of some previous versions of the learning environment questionnaire, and among other things, according to the classroom climate and learning environment questionnaires designed by Barry J. Fraser.

HISTORY OF CONSTRUCTIVISM

It is a very well-known fact that constructivism Constructivism has a long history (von Glasersfeld, 2003; Prichard & Woollard, 2010, Topolovčan, 2015; Topolovčan et al., 2017). Constructivist ideas appear already in the philosophy of ancient Greece (von Glasersfeld, 2003; Prichard & Woollard, 2010, Topolovčan, 2015; Topolovčan et al., 2017). Constructivism is visible in the philosophical ideas of Xenophantes, Pyrrhon and Protagoras. Philosophical ideas of constructivism are recognized in Heraclitus, Socrates and Plato. They are visible in the ideas of Guatham Buddha from the 5th century BC. We can see the characteristics of constructivism in Byzantine thinkers and in the reflections of Taoism. Later, they are also visible in the Christian doctrine of Eriugena from the 9th century. After that, it is possible to recognize it in the ideas of René Decartes, John Locke, David Hume, Giambattista Vico, as well as Immanuel Kant, Johann Gottlieb Fichte and Friedrich Wilhelm Joseph von Schelling (more details in: von Glasersfeld, 2003; Prichard and Woollard, 2010; Topolovčan, 2015; Topolovčan et al., 2017). At the beginning of the 20th century, with the development of science, it separated from an exclusively philosophical perspective. As such, it is recognizable in the knowledge of Humberto R. Maturana and Francisco J. Varela (Topolovčan, 2015; Topolovčan et al., 2017).

Didactic constructivism can be seen in the teaching elements of the concepts of school and education in the international movements of reform pedagogy (Germ. *Reformpädagogik*) (established in the USA and in the English language as "Progressive education" or "The new education", in French as "Education nouvelle", "Ecole active"). That is, in what is called the "new school" from the end of the 19th and the beginning of the 20th century. Reform pedagogy was not a coherent movement; rather, it included different movements, such as the "new schools" or rural boarding schools movement (Germ. *Landerziehungsheime*); the art education movement; the movement of child centered education (Germ. *Pädagogik vom Kinde* aus); the "internal school reform" movement, in particular the "work school" movement; the gymnastics and physical education movement; and personality pedagogy (Oelkers, 2006, p. 202). In Germany, the development of reform pedagogy was related to human science (Germ. *Geisteswissenschaft*), i.e., human science pedagogy (Germ. *Geisteswissenschaftliche Pädagogik*) (Oelkers, 2006). In England, "radical schools" ("radical education") were developed (Oelkers, 2004). The end of the 19th century brought a departure from what is called the "old school" and Herbartism (Batinić, 2014; Jakopović, 1984). Herbart's ideas were in fact considered innovative and "reform and new school" of his time (Higy-Mandić, 1934, p. 3). The movement of reform pedagogy took place as a result of a series of cultural, artistic, technological, economic, social, scientific, political and

ideological turbulent changes, as well as civil activism of the second half of the 19th and the beginning of the 20th century (Gudjons, 1994). Reform pedagogy (the "new education") emerged from (cultural) criticism, not from school practice or educational theory (Oelkers, 2004). New scientific knowledge of then-young science of psychology represented a strong impetus for changes in pedagogy and schooling, as evidenced by the pedagogical actors of that era (Filipović, 1938; Higy-Mandić, 1934; Pataki, 1938). The forerunners of reform pedagogy are the educational ideas of Johann Amos Comenius, Jean-Jacques Rousseau, Johann Heinrich Pestalozzi, Friedrich Wilhelm August Fröbel and Lev Nikolayevich Tolstoy (Batinić, 2014). One of the first alternative schools was founded by Tolstoy in Jasnaja Poljana. Ellen Key and her book "Century of the Child" from 1900 is considered to be the decisive moment that marked the shift toward "new education" and the establishment of the movement of reform pedagogy. The shift refers to distancing from rigid curricular plans and programmes, reproduction of factual knowledge, intellectual school and authoritarianism of the teacher as the sole source of knowledge, as well as authoritarian one-way communication and an undemocratic classroom climate. Likewise, there is a shift from the rigid class-subject-hour system. The elements of the old school are being replaced by a democratic and creative classroom climate, a democratic style of two-way communication between teachers and students, collaborative learning, flexible curricular plans and programs, an emphasis on work and art school, and integrated and project-based teaching. Additionally, learning begins to take place outside the classroom, in laboratories, gardens, nature, studios, workshops, etc.

Certain didactic elements of constructivist teaching can be seen in didactic elements of concepts and movements of reform pedagogy. More specifically, we recognize the outlines of constructivist learning arrangements in the innovative didactic and pedagogical ideas of Célestin Freinet, Rudolf Steiner, Maria Montessori, Peter Petersen, Cornelis "Kees" Boeke, John Dewey, Jean-Ovide Decroly, Helen Parkhurst, Georg Kerschensteiner, Hugo Gaudig, Martin Wagenschein, etc. (Arnold, 2007; Bartz, 2018; Röhrs, 1980; Simons et al., 2002; Siebert, 2005; Skiera, 2010; Topolovčan, 2015; Topolovčan et al., 2017). Viewed from the aspect of the history of pedagogy, one can talk about innovative pedagogical concepts of school and teaching such as the movement for art education movement of Ferdinand Avenarius and Alfred Lichtwark, free groups of Roger Cousinet, active school of Adolphe Ferrière, free development of students of Theodor Litt, free school of Lev Nikolayevich Tolstoy, spontaneous work experience of Georg Kerschensteiner, free spiritual work of Hugo Gaudig, free work groups of Paul Ficker, Waldorf school of Rudolf Steiner, Montessori school and method of Maria Montessori, a school tailored for students' needs of Édouard Claparede, pedagogy of Célestin Freinet, Jena-plan of Peter Petersen and others (Dubovicki & Topolovčan, 2020; Röhrs, 1980;

Skiera, 2010; Topolovčan et al., 2017). By abstracting and summarizing the repertoire of educational innovations of reform pedagogy, it is clear that it also addresses didactic arrangements such as project-based learning, cooperative learning, inquiry-based learning, integrated learning, practical learning and problem-based learning, as well as learning by doing and play-based learning, which implies individualized teaching and a creative democratic classroom climate. Consequently, it is evident that it is a forerunner of what we know in recent times as constructivist teaching. What is certainly characteristic of the didactic conceptions of reform pedagogy is that they were determined by values; thus, certain conceptions and their innovators were artistically (Lichtwark, Avenarious) and socially engaged (Dewey, Lietz, Kerschensteiner, Petersen), religiously inspired (Steiner, Montessori) and ideologically and politically determined (Freinet) (Batinić, 2014; Röhrs, 1980; Skiera, 2010). Reform pedagogy is not unambiguously defined. It can be interpreted in several ways (Gudjons, 1994). Thus, it is explained as the time period in the history of pedagogy from approximately 1900 to the 1930s. It is interpreted as the appearance of a series of singular pedagogical innovations, concepts, schools and education, which includes various new didactic teaching arrangements. Third, it is interpreted as a permanent aspiration to reform education, school and the whole teaching process.

While analyzing the compatibility and coherence of the reform pedagogy movement with constructivist teaching, one should act with care. What is considered constructivist teaching or didactic elements of constructivist teaching represents only partial elements of complete conceptions and schools from the time of reform pedagogy. Therefore, it is still not possible to talk about constructivist teaching as a new paradigm in didactics (Terhart, 1999; 2003). However, constructivism did not offer a complete conception of teaching, school or education with its own curriculum; it was formed only at the level of didactic arrangements of learning and instruction. Certain innovative pedagogical conceptions of teaching and schools of reform pedagogy are indeed socially, aesthetically, culturally, ethically, religiously, ideologically and politically based, which is more difficult to say for constructivist teaching. Therefore, it is justified to note the evidence of constructivist learning arrangements having their didactic beginnings or certain original forms in the movements of reform pedagogy. However, it is not possible to look at the terms reform pedagogy and constructivist teaching as synonyms. What they have in common is the fact that the movement of reform pedagogy is partially based on the then new knowledge of psychology, as well as today's new culture of (constructivist) learning. Recent new learning is connected with the ideas of reform pedagogues of the time (Dewey, Montessori, Steiner, Freinet), but currently, there is a much greater emphasis on the combination of lifelong self-regulated and collaborative learning. A crucial reason for this lies in the fact that we now know much

more about learning processes thanks to the recent knowledge of cognitive psychology, educational neuroscience and educational research (Simons et al., 2002), which also confirms the emergence of the psychological theory of constructivist learning as the third, i.e., the latest form of constructivism.

The beginnings of constructivist Constructivist psychological theories of learning and development appeared in the first half of the 20th century. From that time, Jean Piaget and Lev Vygotsky conducted their first psychological research. Respecting their theories, in the second half of the 20th century, with the development of the cognitive theory of learning and the Atkinson-Shiffrin model and the ideas of Ernst von Glasersfeld, Paul Ernest, Paul Watzlawick, Robert Gagné and Jerome Bruner, as well as the inspiring ideas of Lauren Resnick in the 1980s, a constructivist approach to learning theory was established (Dubovicki et al., 2022). All of that formed a variety of new methods of learning, which, however different they may be from each other, are nevertheless positioned within the framework of constructivist learning based on their premises. Accordingly, we discuss distributed cognition, self-regulated learning, problem-based learning, cognitive flexibility, knowledge building communities, anchored instruction, cognitive apprenticeship, situated learning and so on (Dubovicki et al., 2022; Rodek, 2011; UNESCO, 2002).

CRITICISMS AND BENEFITS OF CONSTRUCTIVIST TEACHING

Paul A. Kirschner, John Sweller and Richard E. Clark (2006) frequently referred criticism of the constructivist teaching (2006). They analyzed the relationship between *directly guided teaching* as a nonconstructivist teaching strategy and *minimally guided instruction* as a constructivist teaching approach. Minimally guided instruction is also called *discovery learning*, *problem-based learning, inquiry-based learning, experiential learning* and *constructivist learning* (Anthony, 1973; Bruner, 1961; Barrows & Tamblyn, 1980; Schmidt, 1983; Papert, 1980; Rutherford, 1964; Boud et al., 1985; Kolb & Fry, 1975, acc. to Kirschner et al., 2006, p. 75). Although minimally guided instruction is labeled with different names, they have in common that they imply teaching based on the principles of the scientific method where students are positioned in the context of learning by research. In this context, students are expected to discover fundamental generally known scientific principles by applying and modeling the activities of professional scientists (Van Joolingen et al., 2005, acc. to Kirschner et al., 2006, pp. 75-76). It should be noted that these authors, although using different names for minimally guided instruction, still generally call it constructivist learning. On the other hand, directly guided instruction is defined as the provision of appropriate information that fully explains the concepts and processes that students need to learn, i.e., as a learning strategy

that is compatible with human cognitive architecture (sensory, short-term/working memory and long-term memory). Learning implies a change in long-term memory (Kirschner et al., 2006, pp. 75). The premises of constructivist learning are learning in authentic situations (environments) or solving authentic problems and learning according to the epistemological structure of the subject discipline, i.e., the principle of the scientific method. One important detail should be noted here, which is that discovery learning, problem-based learning, and inquiry-based learning are not the only forms of constructivist teaching. It goes without saying that if we consider only discovery learning, problem-based learning, and inquiry-based learning strategies as the sole constructivist teaching arrangements, then this criticism is correct, as such a form of teaching provides poorer educational benefits than directly guided instruction. However, from a pedagogical and didactic point of view, discovery learning, problem-based learning, and inquiry-based learning strategies are not synonymous with complete constructivist learning and teaching. Teaching, school and lifelong learning as well as the culture of a school include a series of educational didactic arrangements that go beyond learning exclusively through research. In addition, these are various art, physical, dancing, singing, playing and collaborative activities that are already constructivist in themselves.

Therefore, even when defining the characteristics of constructivist teaching arrangements, one should be careful and not reduce them only to research (scientific) learning. A large part of these criticisms comes from research on teaching processes based on *evidence-based practice* (Biesta, 2007, 2010), which in recent times has been called the *medicalization* of educational research (Tröhler, 2016). This approach to educational research, educational policy and teaching practice based on taking over research practice from medicine has undergone significant criticism. It has been proven that the transfer of such practice is not suitable for education since education and teaching represent, above all, morally and value-determined practice (Biesta, 2007, 2010). Likewise, an important feature of the interpretation of constructivism is the question from which educational tradition one approaches its analysis. Namely, there are differences in the European, i.e., didactic tradition, mainly in the German-speaking area, in the reflection of constructivist teaching, and in the curricular tradition of the Anglo-Saxon speaking area. It is known that there are significant differences in the theories of teaching, learning, and education between didactic and curriculum schools of thought, which is also implied in the definition of constructivist teaching (Autio, 2012; Gundem i Hopmann, 2002; Krogh et al., 2021; Krogh et al., 2023). These authors presented their criticism in three segments (Kirschner et al., 2006). First, they indicate that constructivist learning is inconsistent with the nature of human cognitive architecture. This is especially true for the characteristics and capacities of working memory (short-term memory). Second, constructivist learning promotes cognitive overload in

working memory, which is counterproductive to learning. Third, in a certain knowledge, beginners have a harder time learning in a constructivist manner than students with significant prior knowledge of a subject of study (experts in a certain field).

The presented study by Kirschner, Sweller and Clark (2006) has attracted considerable professional attention. An intriguing reaction to their study is a study edited by Sigmund Tobias and Thomas M. Duffy (2009). In their study, a group of authors presented different points of view regarding the reflection of constructivist teaching. Some of the intriguing and well-argued criticisms of constructivist teaching were addressed from the aspect of inappropriate identification of pedagogy and scientific methods (Kirschner, 2009). Namely, it is indicated that students do not have the developed cognitive abilities of adults and professional scientists. Therefore, it is inappropriate to reduce school learning in classes exclusively to the principles of scientific methods and research methodologies. A significant criticism is also the question of learning evolutionary primary and secondary knowledge (Sweller, 2009). Learning evolutionarily primary skills such as speech may be in the domain of constructivist learning, but evolutionarily secondary skills such as reading, writing and calculus need to be learned with the help of directly guided instruction. Furthermore, it is considered that cognitive activity, and not motor activity, is important for true learning since constructivist teaching does not differentiate the importance of these two activities (Mayer, 2009). Criticism of constructivism is addressed from the methodological aspect. Summarizing the results of research on constructivist teaching, there are no facts that confirm that such teaching is of better quality than direct teaching. In contrast, it is claimed that the majority of research has shown that teaching with directly guided instruction offers better results than constructivist teaching (Alfieri et al., 2011; Mayer, 2004; Rosenshine, 2009). On the other hand, one of the counterarguments to this criticism comes from the domain of educational neuroscience. In the last forty years, the benefits of constructivist teaching have been confirmed in the findings of medical brain research (Caine & Caine, 1994; Geake, 2009; Herrmann, 2009; Jensen, 2005; Kolb & Whishaw, 2009; OECD, 2002, 2007; Velički & Topolovčan, 2017). The findings of educational neuroscience indicate that the learning process is an innate mechanism of brain functioning and holistic development of the human individual. Human activities of research, dealing with novelties and challenges, solving problems, cooperation, two-way and democratic communication, physical movement, artistic and manual work encourage brain development and holistic human development. The mentioned activities represent the immanent elements of constructivist teaching arrangements.

Argued criticisms were also directed from the perspective of school pedagogy (Terhart, 1999; 2003). The extent to which it is possible to leave the

student to independently construct his/her own knowledge without the didactic teaching of the teacher is questioned. Leaving it up to students to construct their own subjective knowledge about established cultural, social, ethical, aesthetic, historical and technological knowledge can have unethical consequences. Thus, there is an emphasis on the importance of national and school curricula. Furthermore, it represents a question of the relevance of situational (contextual) learning, which is a characteristic of constructivist teaching. It is claimed that the knowledge acquired from concrete life situations is applicable exclusively to such identical situations. The essence of school learning based on national and school curricula is the acquisition of knowledge, skills, values and abilities applicable in different life and professional situations, not only in situations of contextual learning. Following that, there is a criticism that points out that constructivist teaching tends to neglect the learning of the teaching content as the entire subject discipline, while it emphasizes the learning of procedural knowledge (Kirschner, Sweller, & Clark, 2006). A kind of counterargument to this criticism indicates that such teaching (situational learning) is truly not ideal for the acquisition of all the educational objectives in the teaching process. Constructivist learning may not be appropriate for immediate problem solving; however, it may be better suited for development and preparation for future learning, i.e., for the development of the ability of *learning to learn* (Schwartz et al., 2009; Spiro & DeSchryver, 2009).

Criticism of constructivist teaching is also directed from the aspect of teacher autonomy (Terhart, 1999, 2003). It is argued that constructivist teaching reduces the autonomy of teachers (Silov, 2019; Terhart, 1999, 2003). Especially in the form of evaluation of students' school achievement. The question arises to what extent is it possible for the teacher to evaluate the student's learning if starting from the constructivist premise that each student constructs his own knowledge independently or in cooperation with others. Such knowledge of an individual student is different from the knowledge of other students, which means that there is no correct or incorrect knowledge. As a result, teachers are limited in their ability to evaluate students' knowledge. The expertise and demonstrated trust in the evaluation of students' knowledge is actually one of the immanent characteristics of the teaching profession. That characteristic is denied by constructivist teaching. The relativization of the teacher's autonomy stems from the conceptual separation of the processes of learning and instruction. In short, it is said that the propagation of radical constructivism is typical constructivist anti-school thinking, where the interaction of teachers and culture is reduced to students' construction of knowledge and teachers as bureaucrats (Rømer, 2018, p. 592). On the other hand, the answer to this criticism can be seen in the argument that constructivist teaching should be evaluated with constructivist evaluation methods and nonconstructivist teaching with nonconstructivist ones (Rosen & Salomon, 2007). This argument is based on the relationship between

the evaluation of students in state and alternative schools, which implies a different anthropology and philosophy of education in certain conceptions of schools. The educational goals of alternative schools are based on anthropology and philosophy in contrast to the conventional state based on efficiency, measurability, standardization, competitiveness and employability taken from the economic world (Nida-Rümelin, 2020). Accordingly, they should be evaluated as their own goals, as well as constructivist teaching.

One of the criticisms of constructivist teaching can be found in the analysis arising from the domain of the structure and reform of state educational systems. The *Global Educational Reform Movement (GERM)* phenomenon appeared in the 1980s (Sahlberg, 2021). The Global Educational Reform Movement has part of its genesis in the consequences of turbulent geopolitical and technological events immediately after the end of the Second World War and then in the Cold War. The *Sputnik shock* caused by the Soviet launch of man into space in 1957 and the Cold War enabled measurability, economization, standardization, and psychologization of education and the hysteria of external evaluation in the USA. The launch of Sputnik is considered to be a reference starting point for the establishment of minimally guided instruction under the baton of Jerome Bruner (Kirschner et al., 2006). Through cooperation with international development agencies and their interventions, these changes were established on a supranational educational level. This has caused the globalization of education (Topolovčan & Dubovicki, 2019). The Global Educational Reform Movement is a consequence of globalization and the idea of increased international exchange of policies and practices (Sahlberg, 2021) and thus the transfer of measurability, standardization, economization and psychologization of education. The globalization of education has been significantly supported by donations from the sphere of global capital, which requires the implementation of the principles of the business world in state educational systems (Ravitch, 2010, acc. to Sahlberg, 2021, p. 177).

The inspiration for the Global Educational Reform Movement comes from three sources (Sahlberg, 2021, pp. 177-178). The first source is the public demand for effective learning and education for all pupils, i.e., education for all. That is, the shift from teaching certain individuals to learning for everybody and increasing the standards of outcomes all via national curricula. The second source is the movement for privatization and competitiveness and responsibility for school success, which is closely related to the mechanisms of accreditation, quality improvement, financing and sanctioning in education, which materializes education as a type of good. The third source is the formation of a new paradigm of learning based on cognitive and constructivist approaches to learning from the 1980s, which shifted the emphasis from the teaching process to the learning process. This results in the pursuit of learning outcomes in the form of conceptual understanding, problem solving, and emotional,

social, and communication skills rather than factual knowledge and traditional educational skills. From the 1980s until today, five recognizable intentions have been implemented in educational policies and (global) reforms of state educational systems: 1) competition between schools, 2) standardized learning, and 3) focus on the main teaching subjects (content), i.e., focus on literacy and numeracy, 4) test-based accountability, and 5) excellence through choice, i.e., parental choice of school in which they want to enrol their child (public or private) (Sahlberg, 2021, pp. 178-181). In summary, constructivist teaching is an agent of supranational educational reforms aimed at mandatory reforms of state educational systems, for which the extent to which they have in common with essential school, critical, democratic, emancipatory, creative and humane learning and teaching is questionable.

This criticism is opposed by the well-argued benefits of constructivist teaching analyzed in a wider sociocultural context and in terms of the structure of the educational system. One thing that educational policy and education in general cannot admit is that the type of school and the quality of educational programs are not the most significant factors in the variance of students' school achievement. The socioeconomic background of the student, i.e., the socioeconomic status of the student's parents, has been proven to be the most significant factor in the variance of the student's school achievement (Jencks et al., 1972; Pastuović, 2009). The socioeconomic status of parents includes their human, social and cultural capital. The higher socioeconomic background of students compensates for the disadvantages of the dominance of teacher-centered didactic teaching arrangements. For a student from a family with a higher socioeconomic status, inactivity in class is compensated by a stimulating learning environment at home. Human, cultural and social capital of a higher socioeconomic status of the student's family is a predictor of more quality learning at home, as well as the encouragement for various educational extracurricular activities. All of that ultimately makes up for the absence of active/constructivist teaching in school. On the other hand, the poorer human, social and cultural capital of families of lower socioeconomic status usually does not compensate for the student's lack of learning activities at school (Pastuović, 2009). However, constructivist teaching provides the optimal educational benefits primarily in primary education, and for higher levels of education, some other didactic arrangements are more suitable for fulfilling educational goals. This should be followed by the special importance of personal concentration in primary education, as well as the possibility of better acquaintance with the student (the student's *internal learning conditions*), which enables the arrangement of individualized student-centered teaching. The possibilities of reducing the negative effect of students' lower socioeconomic background are significantly contributed by the initial education of teachers

for constructivist teaching, as well as the optimal *external learning conditions* (school's pedagogical standard) (Pastuović, 2009).

CONCLUSION

Based on the methodologically historical and theoretical-comparative approach to the analysis of history, theoretical perspectives, conceptualization, advantages and criticisms, some scientific facts regarding constructivist teaching were obtained. Based on this, it is possible to critically interpret and discuss them and offer conclusions regarding the set aims of this study. Therefore, it is justified to state that an interest in constructivist teaching has appeared in the past forty years. Furthermore, constructivist teaching is based on the theories of constructivism. However, there is no single definition and/or theory of constructivism, and it is studied from different theoretical perspectives. As a result, different theoretical variants of constructivism were formed: cognitive, personal, moderate, radical and social constructivism. Although there are several variants, it is possible to classify them into two established ones: radical and social constructivism. Furthermore, constructivism is spoken of as philosophical, psychological and didactic theory. Constructivist learning is defined as an interpretive, nonlinear and self-regulated way of constructing knowledge and cognition in an educational context supported by interactions with the social and physical environment. Constructivist teaching is manifested in the form of integrated learning, practical learning project-based learning, cooperative learning, inquiry-based learning, problem-based learning, learning by doing and play-based learning, which implies individualized teaching and a creative democratic classroom climate.

As an idea, constructivism has a long history. The oldest aspects of constructivism are found in certain philosophical ideas. Constructivist ideas were already recognized in the philosophy of ancient Greece. In the 20th century, constructivism was separated from exclusively philosophical thought and was constituted in different scientific fields. Chronologically, constructivism as a didactic theory appeared later than the philosophical approach. Some of its elements were recognized in the school's pedagogical conceptions and the directions of the reform pedagogy movement from the end of the 19th and the beginning of the 20th century until the mid-1930s. Constructivist teaching arrangements can be seen in innovative pedagogical concepts such as Georg Kerschensteiner's spontaneous work experience, Rudolf Steiner's Waldorf school, Édouard Claparede's school tailored for students' needs, Célestin Freinet's pedagogy, etc. Regarding the genesis of constructivist teaching, it is evident that its individual teaching strategies are established in the didactic elements of the concept and movement of reform pedagogy. Therefore, it is not

possible to talk about constructivist teaching as a completely new paradigm in didactics. However, certain didactic forms of learning and instruction were formed in the 1980s and later. That is why it is justified to state that constructivist teaching strategies are visible in the conceptions of the movement of reform pedagogy, but it is inappropriate to define them as synonymous with the complete conceptions of school and movements of reform pedagogy. The reason for this lies in the fact that constructivist teaching strategies are confirmed or formed by the scientific knowledge of cognitive and developmental psychology and educational neuroscience. However, those are only partial elements of what the entire concepts of school and education of the movement of reform pedagogy had. Constructivist teaching did not offer complete pedagogical conceptions of school, curriculum and education, as was offered by the movement of reform pedagogy. This, in contrast to constructivist teaching, is fundamentally value, ideologically, socially, aesthetically, religiously and politically determined.

Constructivist teaching has received criticism but also appraisal. The repercussion of constructivism in teaching and education is the differentiation of the concepts of learning and instruction in teaching. This resulted in these two concepts becoming two separate reference research frames. A powerful agent in this differentiation was provided by the psychological constructivist theory of learning and, in general, by what is called the psychologization of education. This differentiation is equally positive and negative. In education, the significance of the philosophy of education was replaced by an emphasis on the psychology of education; teaching was replaced by the concept of learning. Among the advantages of constructivist teaching, it is justified to include its focus on the holistic development of students as well as the development of future learning abilities, i.e., learning to learn. It is just to point out that the focus on learning-to-learn largely diminishes the importance of teaching content as a subject discipline. Therefore, the criticism that one of the essences of school and education is the students' acquisition of established cultural, social, democratic, ethical, aesthetic, technological, artistic, historical, value-based and humane knowledge is justified. That is why such a body of knowledge is determined by plans and programs of national curricula. Therefore, the criticism regarding constructivist teaching being focused on learning in authentic and contextual environments that are not generalized to curriculum disciplines is correct to a certain extent. However, knowledge acquired in authentic situations through constructivist teaching is applicable in flexible, unstructured, innovative and creative future circumstances. Likewise, the possibility of evaluating students' school achievement is questionable, which significantly reduces teachers' autonomy in the educational process. However, one should be careful here because the concept of evaluation is not unambiguously defined, especially in different conceptions of alternative schools. That is why it is justified to say

that constructivist learning should be evaluated with constructivist methods and tools.

Constructivist teaching, sometimes labeled student-centered teaching, i.e., individualized teaching, provides benefits from the aspect of the structure of the educational system but is also an agent of the Global Educational Reform Movement. Such a form of teaching can reduce the negative significance that the lower socioeconomic background of the student, i.e., the student's parents, has on the student's school success. Furthermore, an important segment of the advantages of constructivist teaching lies in the fact that its didactic benefits confirm the medical, i.e., neuroscientific, knowledge of brain research. On the other hand, constructivist learning theory favored the development of the Global Educational Reform Movement.

The educational benefits of constructivist teaching vary in relation to the chronological age of students because the importance of prior knowledge, cognitive abilities and motivation in learning is recognized. Therefore, there is a difference in the benefits of constructivist learning between beginners and students with a higher level of prior knowledge, which can cause cognitive overload in the processes of human cognitive architecture. Constructivist teaching, however, is more adequate for students of a lower chronological age, primarily in primary education, especially due to the specificity of the developmental stages of children. On the other hand, one should be careful when defining constructivist teaching arrangements exclusively as discovery learning, problem-based learning and inquiry learning. If we only consider inquiry-based learning strategies as the sole constructivist teaching arrangements, then the criticism that such teaching offers weaker educational benefits than learning in directly guided instruction is correct. These are just some of the strategies from the wide repertoire of constructivist teaching arrangements. Constructivist teaching arrangements include various collaborative forms of learning, as well as teaching arrangements in the field of art, playing, dancing, physical movement, creativity, being in nature, etc. Therefore, it is always necessary to keep in mind that the activities that take place in school are not exclusively learning but the holistic life of children, young people and adults to achieve educational goals.

In the end, the answer to the question of what is wrong with constructivist teaching is that everything is right with it. It is merely not appropriate for all of the educational goals, the content of the teaching, methods of evaluation, educational levels, and the chronological age as well as internal learning conditions of the class participants!

REFERENCES

Aldridge, J. M., Fraser, B. J., Taylor, P. C., & Chen, C. C. (2000). Constructivist learning environments in a crossnational study in Taiwan and Australia. *International Journal of Science Education, 22*(1), 37–55. https://doi.org/10.1080/095006900289994

Alfieri, L., Brooks, P. J., Aldrich, N. J., & Tenenbaum, H. R. (2011). Does dicovery-based instruction enhance learning. *Journal of Educational Psychology, 103*(1), 1–18. https://doi.org/10.1037/a0021017

Arnold, R. (2007). *Ich lerne, also bin ich. Eine systemisch-konstruktivistische Didaktik* [Učim dakle jesam. Sistemsko-konstruktivistička didaktika]. Carl-Auer-Verl.

Autio, T. (2012). *Subjectivity, curriculum, and society between and beyond the German didaktik and Anglo-American curriculum studies*. Routledge.

Autio, T. (2017). Curriculum theory in contestation? American curriculum, European didaktik, and Chinese wisdom traditions as hybrid platforms for educational leadership. In M. Uljens, & R. M. Ylimaki (Eds.), *Bridging educational leadership, curriculum theory and didaktik* (pp. 257–282). Springer. https://doi.org/10.1007/978-3-319-58650-2_7

Babić, N. (2007). Konstruktivizam i pedagogija [Constructivism and pedagogy]. *Pedagogijska istraživanja 4*(2), 217–231.

Bartz, H. (Ed.), (2018). *Handbuch Bildungsreform und Reformpädagogik* [Priručnik reforme obrazovanja i reformne pedagogije]. Springer VS. https://doi.org/10.1007/978-3-658-07491-3

Batinić, Š. (2014). *Povijesni razvoj i recepcija reformne pedagogije u Hrvatskoj* [Historical development and reception of the reform pedagogy in Croatia] (Unpublished doctoral dissertation). Filozofski fakultet Sveučilišta u Zagrebu.

Biesta, G. (2007). Why "what works" won't work. Evidence-based practice and the democratic deficit of educational research. *Educational Theory, 57*(1), 1–22. https://doi.org/10.1111/j.1741-5446.2006.00241.x

Biesta, G. (2010). Why "what works" still won't work: From evidence-based education to value-based education. *Studies in Philosophy and Education*, *29*, 491–503. https://doi.org/10.1007/s11217-010-9191-x

Blankertz, H. (1969/1974). *Theorien und Modelle der Didaktik* [Didaktičke teorije i modeli] (8th ed.). Juventa Vergal.

Bošnjak, Z. (2009). Primjena konstruktivističkog poučavanja i kritičkog mišljenja u srednjoškolskoj nastavi sociologije: pilot istraživanje [Application of constructivist teaching and critical thinking to sociological education at secondary school level: A pilot study]. *Revija za sociologiju, 40*(3–4), 257–277.

Botkin, J. W., Elmandjra, M., & Malitza, M. (1979). *No Limits to learning - Bridging the human gap*. Pergamon Press Ltd.

Caine, R. N., & Caine, G. (1994). *Making connections: Teaching and the human brain*. ASCD.

De Corte, E., Verschaffel, L., Entwistle, N., & van Merriënboer, J. J. G. (Eds.) (2003). *Powerful learning environments: Unravelling basic components and dimensions.* Elsevier Science.

Dubovicki, S., & Topolovčan, T. (2020). Through the looking glass: Methodological features of research of alternative schools, *Journal of Elementary Education, 13*(1), 55–71. https://doi.org/10.18690/rei.13.1.55-71.2020

Dubovicki, S., Jukić, R., & Topolovčan, T. (2022). Izazovi nastavničkog poziva u budućnosti [Challenges of the teaching profession in the future]. In D. Luketić, (Ed.), *Ogledi o nastavničkoj profesiji* (pp. 155–178). Sveučilište u Zadru.

Duffy, T. H., Lowyck, J., & Jonassen, D. H. (Eds.). (1992). *Designing environments for constructive learning*. Springer. https://doi.org/10.1007/978-3-642-78069-1

Filipović, V. (1938). *Moderna psihologija u pedagogiji* [Modern psychology in pedagogy]. Minerva.

Fosnot, C. T., & Perry, R. S. (2005). Constructivism: A psychological theory of learning. In C. T. Fosnot (Ed.), *Constructivism: Theory, perspectives and practice* (pp. 8–33). Teacher College Press.

Funa A. A., & Talaue, T. F. (2021). Constructivist learning amid the covid-19 pandemic: Investigating students' perceptions of biology self-learning modules. *International Journal of Learning, Teaching and Educational Research, 20*(3), 250–264. https://doi.org/10.26803/ijlter.20.3.15

Geake, J. G. (2009). *The brain at school: Educational neuroscience in the classroom*. The McGraw-Hill i Open University Press.

Guba, E., & Lincoln, Y. S.(2005). Paradigmatic controversies, contradictions, and emerging confluence. In N. K. Denzin, & Y. S. Lincoln (Eds.),*The SAGE Handbook of Qualitative Research* (pp. 192–215). Sage.

Gudjons, H, (1994). *Pedagogija: temeljna znanja* [Pedagogy: Key concepts]. Educa.

Gudjons, H., Teske, R. i Winker., R. (Eds.). (1992). *Didaktičke teorije* [Didactic theories]. Educa.

Gundem, B. B., & Hopmann, S. (Eds.). (2002). *Didaktik and/or curriculum*: *An international dialogue*. Peter Lang.

Herrmann, U. (Ed.). (2009). *Neurodidaktik: Grundlagen und Vorschläge für gehirngerechtes Lehren und Lernen* [Neurodidaktika: Osnove i prijedlozi za poučavanje i učenje prilagođeno mozgu]. Beltz Verlag.

Heuer, U., Botzat, T., & Meisel, K. (Eds.). (2001). *Neue Lehr- und Lernkulturen in der Weiterbildung* [Nove kulture poučavanja i učenja u budućem obrazovanju]. Deutsches Institut fur Weiterbildung i Bertelsmann.

Higy-Mandić, F. (1934). *Uzgojni domovi i nastava u prirodi* [Educational homes and teaching in nature]. Minerva.

Hopmann, S., & Riquards, K. (1995). Starting a dialogue: Issues in a beginning conversation between *Didaktik* and the curriculum traditions. *Journal of Curriculum Studies, 27*(1), 3–12. https://doi.org/10.1080/0022027950270102

Jakopović, S. (1984). *Pokret radne škole u Hrvatskoj* [Work school movement in Croatia]. Školske novine.

Jencks, C. et al. (1972). *Inequality*: *A Reassessment of the Effects of Family and Schooling in America.* Basic Books.

Jensen, E. (2005). *Poučavanje s mozgom na umu* [Teaching with the brain in mind]. Educa.

Jonassen, D. (1991). Objectivism vs. Constructivism. *Educational Technology Research and Development, 39*(3), 5–14. https://doi.org/10.1007/BF02296434

Jukić, R. (2013). Konstruktivizam kao poveznica poučavanja sadržaja prirodoznanstvenih i društvenih predmeta [Constructivism as a link between teaching contents of scientifi c and social subjects]. *Pedagogijska istraživanja, 10*(2), 241–263.

Kim, H.-B., Fisher, D. L., & Fraser, B. J. (2006). Assessment and Investigation of Constructivist Science Learning Environments in Korea. *Research in Science & Technological Education, 17*(2), 239–249. https://doi.org/10.1080/0263514990170209

Kiper, H., & Mischke, W. (2008). *Uvod u opću didaktiku* [Introduction in general didactic]. Educa.

Kirchner, P. A. (2009). Epistemology or pedagogy, that is the question. In S. Tobias & T. M. Duffy (Eds.), *Constructivist instruction: Success or failure?* (pp. 144–157). Routledge.

Kirchner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational psychologist, 41*(2), 75–86. https://doi.org/10.1207/s15326985ep4102_1

Kolb, B., & Whishaw, I. Q. (2009). *Fundamentals of human neuropsychology*. W. H. Freeman.

Könings, K. D., Brand-Gruwel, S., & van Merriënboer, J. J. G. (2005). Towards more powerful learning environments through combining the perspectives of designers, teachers and students. *British Journal of Educational Psychology, 75,* 645–660. https://doi.org/10.1348/000709905X43616

Könings, K. D., Brand-Gruwel, S., van Merriënboer, J. J. G., & Broers, N. J. (2008). Does a new learning environment come up to students' expectations? A longitudinal study. *Journal of Educational Psychology, 100*(3), 535–548. https://doi.org/10.1037/0022-0663.100.3.535

Kösel, E. (1997). *Subjektive Didaktik. Die Modellierung von Lernwelten* [Subjektivna didaktika. Modeliranje svjetova učenja]. Laub.

Krogh, E., Qvortrup, A., & Graf, S. T. (2021). *Didaktik and curriculum in ongoing dialogue*. Routledge. https://doi.org/10.4324/9781003099390

Krogh, E., Qvortrup, A., & Graf, S. T. (2023). *Bildung, knowledge, and global challenges in education. Didaktik and curriculum in the anthropocene era*. Routledge. https://doi.org/10.4324/9781003279365

Kron, F. W., Jürgens, E., & Standop, J. (2014). *Grundwissen Didaktik* [Key concepts of didactic] (6th ed.). Ernst Reinhardt Verlag. https://doi.org/10.36198/9783838585758

Kwan, Y. W. (2020). Psychometric properties of a Chinese version of the Constructivist earning environment survey among secondaryschool students in Hong Kong. *Learning Environments Research, 23*, 167–184. https://doi.org/10.1007/s10984-019-09301-1

Langford, P. E. (2005). *Vygotsky's developmental and educational psychology*. Psychology Press. https://doi.org/10.4324/9780203499573

Matijević, M., Topolovčan, T., & Rajić, V. (2017). Teacher assessment related to the use of digital media and constructivist learning in primary and secondary education. *Croatian Journal of Education, 19*(2), 563-603. https://doi.org/10.15516/cje.v19i2.2411

Mayer, R. E. (2004). Should there be a three-strikes rule against pure discovery learning? *American Psychologist, 59*(1), 14–19. https://doi.org/10.1037/0003-066X.59.1.14

Mayer, R. E. (2009). Constructivism as a theory of learning versus constructivism as a prescription for instruction. In S. Tobias, & T. M. Duffy (Eds.), *Constructivist instruction: Success or failure?* (pp. 184–200). Routledge.

Merrill, M. D. (1991) Constructivism and instructional design. *Educational Technology, 31*(5), 45–53.

Müller, K. (Ed.) (1996). *Konstruktivismus. Lehren-Lernen-Ästhetische Prozesse* [Constructivism. Teaching-learning-aesthetic processes]. Luchterhand.

Nida-Rümelin, J. (2020). *Filozofija humanog obrazovanja* [Philosophy of humanistic education]. Školska knjiga.

OECD (2002). *Understanding the Brain: Towards a New Learning Science*. https://doi.org/10.1787/9789264174986-en

Oelkers, J. (2004). Nohl, Durkheim, and Mead: Three different types of "history of education". *Studies in Philosophy and Education 23*, 347–366. https://doi.org/10.1007/s11217-004-4449-9

Oelkers, J. (2006). The strange case of German "Geisteswissenschaftliche Pädagogik". In R. Hofstetter, & B. Schneuwly (Eds.), *Passion, fusion, tension. New education and educational sciences: End 19th - middle 20th century* (pp. 191–222). Bern: Peter Lang.

Oelkers, J. (2010). *Reformpadagogik: Entstehungsgeschichten einer international Bewegung* [Reform pedagogy: stories of the emergence of an international movement]. Klett und Balmer Verlag Zug.

Oldfather, P., West, J., White, J., & Wilmarth, L. (1998). *Learning through children's eyes: Social constructivism and the desire to learn.* American Psychological Association. https://doi.org/10.1037/10328-000

Pastuović, N. (2009). Kvaliteta hrvatskog obrazovanja [The quality of the Croatian educational system]. *Napredak, 150*(3–4), 320–340.

Pataki, S. (1938). *Problemi i pravci reformne pedagogije* [Problems and movements of the reform pedagogy]. Minerva.

Phillips, D. C. (1995). The good, the bad and the ugly: The many faces of constructivism. *Educational Researcher, 24*(7), 5–12. https://doi.org/10.3102/0013189X024007005

Prichard, A., & Woollard, J. (2010). *Psychology for the classroom: Constructivism and social learning*. Routledge.

Reich, K. (2012). *Konstruktivistische Didaktik* [Constructivist didactic] (5th ed.). Beltz Verlag.

Rodek, S. (2011). Novi mediji i nova kultura učenja [New media and new learning culture]. *Napredak, 152*(1), 9–28.

Röhrs, H. (1980). *Die Reformpädagogik. Ursprung und Verlauf in Europa* [The Reform Pedagogy. Origin and course in Europe]. Hermann Schroedel Verlah Kg.

Rømer, T. A. (2018). A critique of John Hattie's theory of Visible Learning, *Educational Philosophy and Theory, 51*(6), 587–598. https://doi.org/10.1080/00131857.2018.1488216

Rosen, Y., & Salomon, G. (2007). The differential learning achievements of constructivist technology-intensive learning environments as compared with traditional ones: A meta-analysis. *Journal of Educational Computing Research, 36*(1), 1–14. https://doi.org/10.2190/R8M4-7762-282U-554J

Rosenshine, B. (2009). The empirical support for direct instruction. In S. Tobias, & T. M. Duffy (Eds.), *Constructivist instruction: Success or failure?* (pp. 201–220). Routledge.

Rudić, L. (2022). *Uloga konstruktivističkog učenja, nastavničke interakcije i samoučinkovitosti u dosadi na nastavi kod učenika osnovnog obrazovanja* [The role of constructivist learning, teacher interaction and self-efficacy in classroom boredom among elementary education students] (Unpublished doctoral dissertation). Učiteljski fakultet Sveučilišta u Zagrebu.

Sahlberg, P. (2021). *Finnish lessons. What can the world learn from educational change in Finland?* (3rd ed.). Teachers College Press.

Schwartz, D. L., Lindgren, R., & Lewis, S. (2009). Constructivism in an age of non-constructivist assessments. In S. Tobias, & T. M. Duffy (Eds.), *Constructivist instruction: Success or failure?* (pp. 34–61). Routledge Publications.

Siebert, H. (2005). *Pädagogischer Konstruktivismus. Lernzentrierte Pädagogik in Schule und Erwachsenenbildung* [Pedagogical Constructivism. Learning-centered pedagogy in school and adult education] (3rd ed.). Beltz Verlag.

Silov, M. (2019). Autonomija škole, učiteljska profesija i reforme školskih sustava [School Autonomy, Teacher Profession and School System Reform]. In I. Klasnić (Ed.), *Suvremene teme u odgoju i obrazovanju - STOO Pedagogija i psihologija: od ispravljanja nedostataka do poticanja osobnih snaga i vrlina* (pp. 267–280). Sveučilište u Zagrebu Učiteljski fakultet.

Simons, R. J., van der Linden, J., & Duffy, T. (Eds.). (2002). *New Learning*. Kluwer Academic Publishers.

Skiera, E. (2010). *Reformpädagogik in Geschichte und Gegenwart* [Reform pedagogy in the past and present] (2nd ed.). Oldenbourg. https://doi.org/10.1524/9783486851328

Spiro, R. J., & DeSchryver, M. (2009). Constructivism: When it' s the wrong idea and when it's the only idea. In S. Tobias, & T. M. Duffy (Eds.), *Constructivist instruction: Success or failure?* (pp. 106–124). Routledge.

Sweller, J. (2009). What human cognitive architecture tells us about constructivism. In: S. Tobias, & T. M. Duffy (Eds.), *Constructivist instruction: Success or failure?* (pp. 127–143). Routledge Publications.

Taylor, P. C., Fraser, B. J., & Fisher, D. (1997). Monitoring constructivist classroom learning environments. *International Journal of Educational Research*, *27*, 293–302. https://doi.org/10.1016/S0883-0355(97)90011-2

Taylor, P. C., Fraser, B. J., & White, L. R. (1994). An instrument for monitoring the development of constructivist learning environments. *Paper presented at the annual meeting of the American Educational Research Association*, New Orleans, LA.

Terhart, E. (1999). *Konstruktivismus und Unterricht. Gibt es einen neuen Ansatz in der Allgemeinen Didaktik?* [Constructivism and teaching: a new paradigm in general didactics?]. *Zeitschrift für Pädagogik, 45*(5), 629–647.

Terhart, E. (2002). Changing concepts of curriculum: From „Bildung" to „learning" to „experience". Developments in (West) Germany from 1960s to 1990. In B. B. Gundem, & S. Hopmann (Eds.), *Didaktik and/or curriculum*: *An international dialogue* (pp. 107–126). New York: Peter Lang.

Terhart, E. (2003). Constructivism and teaching: a new paradigm in general didactics? *Journal of Curriculum Studies, 35*(1), 25–44. https://doi.org/10.1080/00220270210163653

Tobias, S., & Duffy, T. M. (Eds.). (2009). *Constructivist instruction: Success or failure?* Routledge. https://doi.org/10.4324/9780203878842

Topolovčan, T. (2015). *Uloga novih medija i računalna samodjelotvornost u individualiziranoj i konstruktivističkoj nastavi* [Role of new media and computer self-efficacy in an individualized and constructivist teaching] (Unpublieshed d dissertation). Učiteljski fakultet Sveučilišta u Zagrebu.

Topolovčan, T. (2016). Art-based research of constructivist teaching. *Croatian Journal of Education, 18*(4), 1141–1172. https://doi.org/10.15516/cje.v18i4.2074

Topolovčan, T., & Dubovicki, S. (2019). The heritage of the Cold War in contemporary curricula and educational reforms. *Center for Educational Policy Studies Journal,* 9(2), 11–32. https://doi.org/10.26529/cepsj.567

Topolovčan, T., & Matijević, M. (2016). Characteristics of using digital media as predictors of constructivist teaching in lower secondary education in Croatia. *International Journal of Knowledge, Innovation and Entrepreneurship*, *4*(1–3), 35—52.

Topolovčan, T., & Matijević, M. (2017). Critical thinking as a dimension of constructivist learning: some of the characteristics of students of lower secondary education in Croatia. *Center for Educational Policy Studies Journal, 7*(3), 47–66. https://doi.org/10.26529/cepsj.287

Topolovčan, T., Matijević, M., & Dumančić, M. (2016). Some predictors of constructivist teaching in elementary education. *Croatian Journal of Education, 18*, Sp.Ed.1, 193–212. https://doi.org/10.15516/cje.v18i0.2217

Topolovčan, T., Rajić, V., & Matijević, M. (2017). *Konstruktivistička nastava: teorija i empirijska istraživanja* [Constructivist teaching. Theory and empirical research]. Učiteljski fakultet Sveučilišta u Zagrebu.

Tröhler, D. (2016). The medicalization of current educational research and its effects on educational policy and school reforms. *Discourse: Studies in the Cultural Politics of Education, 36*(5), 749–764. https://doi.org/10.1080/01596306.2014.942957

UNESCO (2002). *Information and communication technologies in teacher education: A planning guide*.

van Bergen, P., & Parsell, M. (2019). Comparing radical, social and psychological constructivism in Australian higher education: A psycho-philosophical perspective. *The Australian Educational Researcher*, *46*(1), 41–58. https://doi.org/10.1007/s13384-018-0285-8

Velički, V., & Topolovčan, T. (2017). Neuroznanost, nastava, učenje i razvoj govora [Neuroscience, teaching, learning and speech development]. In M. Matijević (Ed.), *Nastava i škola za net-generacije* (pp. 77–114). Učiteljski fakultet Sveučilišta u Zagrebu.

Vican, D. (2007). Znanje vrijedno znanja – znanje vrijedno poučavanja [Knowledge Worth Knowing – Knowledge Worth Teaching]. *Pedagogijska istraživanja, 4*(2), 231–238.

von Glasersfeld, E. (2003). *Radical constructivism. A way of knowing and learning*. Routledge Publication.

Wierstra, R. F. A., Kanselaar, G., van der Linden, J. L., & Lodewijks, H. G. L. C. (1999). Learning environment perceptions of European university students. *Learning Environments Research, 2,* 79–98. https://doi.org/10.1023/A:1009962024666

Yılmaz, S. S., Yıldırım, A., & İlhan, N. (2022). Effects of the context-based learning approach on the teaching of chemical changes unit. *Journal of Turkish Science Education*, *19*(1), 218–236. https://doi.org/10.36681/tused.2022.119