Studia Periegetica nr 4(28)/2019
DOI: 10.26349/st.per.0028.09

Wojciech Bień*, Ivan Čillík**

Multimedia Education in Motor Learning and Teaching: the Development of Skiing Technique

Abstract. The aim of this article is to identify the benefits of multimedia education and its application in the process of motor learning and teaching. This descriptive study is based on the review of the literature and other authors' research results. The use of multimedia tools in psychomotor education can facilitate the visualisation of motor activities and the creation of a motor program. The use of multimedia education in the teaching of downhill skiing can help students achieve good results.

Keywords: motor learning, multimedia education, multimedia textbook, skiing

1. Introduction

The last two decades have brought many significant political, social, and technological changes. One of them is the technological transformation, particularly in information transmission, handling, and processing, and its use for the modernization of the multi-channel communication process. These changes are evidenced by various indicators, including the number of global Internet users, which has already exceeded 4.5 billion,[1] i.e. 60% of the world population. In 2016,

* Opole University of Technology (Poland), Faculty of Physical Education and Physiotherapy, e-mail: w.bien@po.edu.pl, orcid.org/0000-0003-1026-2381.

** Matej Bel University, Banská Bystrica (Slovakia), Department of Physical Education and Sports, e-mail: ivan.cillik@umb.sk, orcid.org/0000-0002-5698-5588.

[1] Source: http://internetworldstats.com/stats.htm [accessed: 15.09.2019].

more than 80%[2] of households in Poland had a computer with Internet access. One can expect that this technological development will soon enable accelerated progress in every sphere of science and life.

The above changes also drive the evolution in the learning and teaching process.

The impact of information and communication technologies on the lives of people all over the world, especially on the young generation (the so-called generation Y and C) is also significant. Our present society is described as an information society or a knowledge society, which has created a knowledge-based economy populated by knowledge organizations [Nowak 2008; Senge 2012]. The new media have created a new type of human being – a student – a digital native [Prensky 2001], for whom the technological world has no secrets, where he or she feels comfortable and which is their natural environment [Morbitzer 2011]. Neurologists believe that new technologies have caused changes in the brain's neural networks, as a result of which our way of thinking has shifted from linear to network-based and multi-threaded [Small, Vorgan 2009]. This brings a number of positive and negative consequences. One should keep in mind that the new media are merely tools and it is up to people how they are used. The role of the "new school" and the "new teacher" today is primarily to derive positive effects from the use of technology and to search for reasonable compromises on how it is used. In the context of new expectations and challenges faced by modern education, the teacher may need appropriate competences, such as, for example, creative or IT skills [Umiastowska 2001, 2004].

The dynamics of changes in the processing of information and social communication call for modifications to the teaching methods, including in the field of physical education. The search for effective teaching methods in physical education prompts us to support our teaching with technology – in this case multimedia education in the form of a multimedia textbook, for example.

The majority of research on the use of new information and communication technologies in education relates mainly to the sphere of theoretical school and academic subjects as well as industry-specific courses. There is little research on the physical culture, especially in the area of motor learning and teaching. This fact provokes reflection on the modification of didactic methods and the use of new tools in psychomotor teaching. The information potential of digital media may improve the effectiveness of how motor activities are learned and taught.

The goal of the article is to demonstrate the importance of multimedia education in the process of motor learning and teaching. The practical purpose of

[2] Source: http://stat.gov.pl/obszary-tematyczne/nauka-i-technika-spoleczenstwo-informacyjne/spoleczenstwo-informacyjne/spoleczenstwo-informacyjne-w-polsce-w-2016-roku,2,6.html [accessed: 10.04.2017].

the study is to exemplify the application of multimedia education in the development of the skiing technique. The article consists of three sections. The first one presents the theoretical assumptions of multimedia education. The second section describes a multimedia textbook as a teaching tool. The third section discusses selected problems of motor learning and teaching in the development of the skiing technique.

2. Theoretical foundations of multimedia education

The theory of multimedia education is widely described in the literature [Bednarek 2006; Gulińska 2012; Siemieniecki, 2003, 2007; Walat 2004, 2007]. It derives from the trend in cognitive theories of learning and teaching (cognitive & constructivist), which are based, among others, on information processing, memory, and concentration. One of the basic concepts invoked in this context is memory. It is defined as "a relatively permanent record of experience that underlies learning" [Anderson 1998: 22]. Cognitive learning theories are based on the warehouse model of memory, which distinguishes three types of memory: sensory memory (STSS – Short-Term Sensory Store), short-term memory (STM – Short-Term Memory), and long-term memory (LTM – Long-Term Memory).

Multimedia meet current expectations of students and teachers. They can effectively strengthen the learning process, especially perception, repetition, and semantic coding, i.e. storing and retrieving information from long-term memory [Walat 2007]. Multimedia content enables simultaneous processing of visual and auditory information. It facilitates a more complete mapping of reality and corresponds to the natural process of human learning about the world [Paivio 1986]. We can talk about the multi-sensory reception of multimedia content. The same information is sent through two (not one) perception channels to the memory. Such multi-channel information transmission can potentially increase the learning and teaching effects. The double coding model proposed by Paivio [1986] shows that two separate, but interrelated systems – verbal and nonverbal (called the imaginary system) – are involved in the cognitive processes. They are responsible for coding, storing, organizing, transforming, and retrieving information. The non-verbal perceptual stimuli are processed and coded directly in the imaginary system (in the form of *imagens*, visual mappings) and indirectly, in the verbal system (in the form of *logogens*, verbal mappings.) Similarly, in the case of verbal stimuli, the order is opposite.

The storage model of memory is complemented by Anderson's ACT (*Adaptive Character of Thought*) theory, which distinguishes three types of memory: declarative, procedural and working memory. The declarative and procedural

memories are permanent memories. The declarative memory (the so-called "that" knowledge) contains information about facts and events that are stored in verbal form or can easily be verbalized. The procedural memory (the so-called "how" knowledge) contains procedures and programs for mental and motor activities, which are commonly called skills. These include motor skills (e.g. skiing) or cognitive skills [Włodarski 1996; Nęcka, Orzechowski, Szymura 2008; Gerrig, Zimbardo 2012].

In order to define the concept of multimedia education, one need to clarify the constituent concepts. The term 'multimedia' consists of two words: 'multi' (Latin word for '*many*') and 'medium' (Latin word for '*center*'.) In the field of pedagogy, the media are didactic aids [Kameduła 2000: 238], all objects that convey specific information (messages) through words, images and sound, enabling intellectual and manual actions [Strykowski 1996].

Multimedia education is an example of educational technology and it is defined as the concept of the teaching, learning, or self-education process, which involves the comprehensive use of functionally selected traditional and modern teaching aids (multimedia) [Bednarek 2006: 85]. Multimedia education is the process of multi-channel (polysensory) teaching – learning, which affects the student at multiple levels, not only by means of verbal signs, but also using visual and audio inputs [Walat 2007].

Didactic aids include material, complementary objects that enrich didactic activity, whose main goal is to optimize the teaching-learning process [Okoń 2003: 275] through the sense of sight, hearing, or touch, and help students to learn about the reality directly or indirectly [Kupisiewicz 1994]. The literature provides many classifications of teaching aids, including natural, technical, symbolic; simple and complex; traditional and modern; visual, auditory, and polysensory, unidirectional and omnidirectional [Strykowski 1984, 1990; Skrzydlewski 1990; Perch 2003; Siemieniecki 2007].

3. The multimedia textbook as a teaching tool

A multimedia textbook is an application of modern technology to teaching. It is a digital tool that contains multimedia and hypertext structures. Walat [2004] defines it as a multimodal text (i.e. requiring polysensory reception), which is an integrated collection of various methodical support materials, with special emphasis on audiovisual content, with a uniform structure, where highlighted elements contain hyperlinks. Hypertext is an element of a multimedia textbook. It is a kind of a non-linear medium of information with links that can be activated by the reader [Kerckhove 2001] to choose an individual path of navigat-

ing through the information resources. Hypertext containing links to multimedia content, such as video or audio, is sometimes referred to as hypermedia.

Instructional videos are an important component of a multimedia textbook. The purpose of such videos is to achieve specific learning objectives by providing content presented according to a specific program and according to pedagogical principles (i.e. content includes specific teaching materials and is adapted to certain student characteristics), which is part of a specific teaching process [Strykowski 1984: 160]. The most important feature of an instructional video is that it enables to record body movements. Research has shown the significance of the intentional and skilful use of instructional videos in the process of motor teaching; they help learners, among other things, to create an internal representation of movement (and thus aid in its execution) and provide additional motivation [Wiesner 1991]. Instructional videos are the only educational media that enable students to acquire practical skills without a direct demonstration by the teacher [Jędryczkowski 2010]. This is particularly important in the teaching and learning of motor activities. Instructional videos embedded in hypertext structures of a multimedia textbook can be repeatedly watched by the student, at various speeds (including freeze frames), at any time, which helps to individualize the learning process. Nowadays instructional videos are gaining a new significance. They can be easily created, edited and displayed on many devices (smartphones, tablets, laptops, etc.). Because videos can easily be embedded in hypertext structures (textbooks) and published online, they can be called a hypermedium. The popularization and universal access to digital video playback and recording tools, the ability to create high-quality video materials (high definition), the ability to use and edit recorded material in computer applications – are additional arguments in favour of using video technology in motor teaching [Wiesner et al. 2010].

The multimedia textbook has many advantages, such as individualization of the learning process, interactivity, the ease of modifying and correcting existing content or adding new content.

With regard to cognitive theories of learning and teaching, it can be argued that multimedia aids can help to better "anchor" new information in memory by arousing curiosity, reframing new content in familiar terms, using many perception channels, combining new information with known sensory perceptions [Vester 2006; Siemieniecki 2007; Walat 2007].

The use of multimedia education is commonly discussed in research. Most studies, however, concern the learning and teaching of intellectual content, mainly related to conceptual (semantic) knowledge.

Many studies have long confirmed the effectiveness of learning and teaching supported by new technologies. Studies have shown that multimedia education, compared to traditional education, improves efficiency, understanding

of the subject, reduces misunderstandings of the knowledge transferred, saves time, increases the pace of teaching and the breadth of assimilated knowledge [Adams 1992; Steinbrink 1993]. A review of research conducted by other authors makes it possible to identify four main factors that determine the effectiveness of multimedia education: the possibility of individual management of the didactic process by the student, the ability to receive immediate feedback, high educational interactivity, and the ability to adapt the pace of teaching to the student's preferences [Bodemer et al. 2004; Domagk Schwartz, Plass 2010; Doaa Abd El-Moneim 2014].

The learning and teaching of motor activities is governed by the same general principles that apply to intellectual content learning [Czabański 1998, 2000; Anderson 1998; Hotz, Weineck 1988]. Based on the above assumption, it is reasonable to investigate the use of multimedia in the field of physical education (for the purpose of motor learning and teaching)

4. Selected problems of motor learning and teaching as exemplified by the development of the skiing technique

The process of motor learning and teaching has been widely presented in the existing literature. Movement is a visible shift of body parts in relation to each other or to external objects. In the literature the term 'motor activities' refers to movements that are conscious, purposeful, and free [Czyż 2013]. We can perform motor activities thanks to the skills we acquire in the process of learning. Motor skills we learn are specific (intended for a specific task), consistently performed goal-oriented movements [McMorris 2004: 2]. Therefore, the acquired motor skills determine the performance of the movement itself. One can talk about skills when a motor activity is performed correctly in subsequent repetitions (i.e. it looks similar or identical each time).

The process of learning motor activities refers to changes that take place in the human motor skills and involves sensory reception of information about a previously unknown movement from the environment, the mental processing of this information, the performance of the movement, and checking the effectiveness of this performance [Czabański 1980: 10]. Schmidt and Wrisberg [2009] define motor learning as exercise or experience processes that lead to relatively permanent changes in motor skills. The effectiveness of these processes depends on sensory and mental cognition as well as on active practice [Umiastowska 1998]. Thus, they can be regarded as cognitive processes, synonymous with general learning. In line with trends in cognitive theories of learning and teaching, we can assume that motor learning is also based on information processing, memory, and concentration

mechanisms. According to Anderson's ACT theory, procedural knowledge corresponds to skills (motor skills), and procedural knowledge acquisition corresponds to the acquisition of motor skills [Anderson 1998]. According to Fitts and Posner [1967], Anderson [1998], and Schmidt and Wrisberg [2009], motor learning takes place in three stages: cognitive (verbal-cognitive), associative (motor), and autonomous (independent). According to Pöhlmann's "learning spiral" [1985], we learn motor activities by repeating constant phases, at progressively higher levels, where the following stages can be distinguished: reception and pre-selection of information based on previous experiences, information processing – analysis and evaluation, planning and mental visualisation of motor activities, programming and determining the sequence (algorithm – program) of movements, execution of physical activity (program implementation), control (evaluation), and comparison of the result with the pre-set goal [Czabański 2000; Petryński 2008]. Czajkowski [2004] also refers to the above principles; he distinguishes four stages of movement habit learning: visualisation of a movement, mastering the basic structure of the movement, automating and consolidating the habit.

In the cognitive context, information plays an important role in the teaching and learning of motor activities [Czabański 2000]. Properly transmitted, actively and consciously received information leads to a greater involvement of thought processes in the student [Czabański 1998; Gracz, Sankowski 2000]. When the movement is described, its mental image is created in the imagination. Visualisation of motor activity is "key to the efficient teaching" of the movement [Pöhlmann 1985]. The significance and usefulness of visualization in the process of teaching and learning motor activity is evidenced by results of pedagogical experiments carried out in sports disciplines such as swimming [Wiesner 1991; Guła-Kubiszewska 1993; Dybińska 2004] and downhill skiing [Lesiewski 1995; Parnicki 1998]. Ideomotorics is the mental anticipation of motor activity, e.g. visualization of the ski turn before performing it. Studies have shown that the mere idea of movement is enough to evoke it slightly [Puni 1975]. There are three functions of motor visualization: programming, training, and regulating. In motor learning, the following functions are particularly important: programming (the student imagines the purpose and manner of performing an activity on the basis of visual, verbal, and kinaesthetic information) and the regulating function (the possibility to control and correct the activity in practice by imagining how to perform it). One way how motor ideas can be used in motor learning is mental practice. It involves practicing a motor activity by imagining it, i.e. exercising at the cognitive level without physical exercise [Czyż 2013]. Mental exercise is a mental (cognitive) repetition of the movement [Magill 2007].

Motor imaginations lead to the formation of a mental plan – motor memory. The mental plan is a representation of an action and the algorithm of movements, or a set of pointers that help to perform this action [Czabański 1998: 101]. The

mental plan is created on the basis of verbal, visual and kinaesthetic information. The correct mental plan of a motor activity is greatly influenced by the amount of knowledge acquired in the form of verbal instruction, description of the activity structure, demonstration, and explanation of the effective performance of the action. Most often, such knowledge is provided by the teacher and teaching aids (materials).

The existence of an internal representation of motor activity (mental plan) is confirmed by schematic theory [Schmidt, Wrisberg 2009], in which a motor program is an important link. This theory is based on earlier achievements of Adams [1971], the creator of the closed loop theory. Schmidt distinguishes between two mechanisms responsible for the acquisition and control of motor activities: the open loop mechanism – for very short motor activities (i.e. less than 0.2 seconds), the closed loop mechanism – for longer motor activities (i.e. over 0.2 seconds). It is assumed that at the initial stage of motor learning, most movements are performed by employing the closed-loop mechanism. The student is focused, performs an activity slowly with utmost diligence monitoring the spatial structure of the movement, his attention is focused on performance, with a great involvement of consciousness [Czyż 2013]. Anderson claims that the closed-loop phase includes the most conscious and intended processes of the cognitive and associative stage [Anderson 1998: 384]. According to this view, motor learning process can be regarded as an intellectual (cognitive) process.

According to Schmidt, the motor program is "a structure containing (defining) important details of the motor activity (skilful movement), centrally located (in the central nervous system) [Schmidt 1991: 285]. Anderson [1998: 382] defines the motor program as a pre-determined sequence of actions". According to Anderson [1998: 382], the process of learning a complex activity can be broken down into learning smaller sequences that make up this activity. The motor program is therefore an internal representation of the motor activity.

This articles focuses on the development of the skiing technique, which involves mastering motor activities on a snow slope in a specific natural environment. However, the correct skiing technique is difficult to master [Sankowski 2001]. It is characterized by considerable technical complexity [Zatoń 1996; Gracz, Sankowski 2000], and involves a specific body posture that deviates from everyday motion experiences, and forms of motor coordination unnatural for the average person [Ziemilski 1977; Zatoń 1996]. The ability to perform individual ski evolutions (e.g. semi-plough turn, angular extension turn, etc.) is of an extremely technical nature [Zatoń 1996]. During one continuous movement (slip) the skier must perform a number of motor activities including bending, straightening and rotation of the legs, driving the stick, moving the centre of gravity in different planes. They all make up the so-called sports technique (skiing technique). In the context of didactics, a sports technique is a specific manner of

performing a physical activity that requires the least amount of effort and ensures maximum effectiveness [Czabański 1998].

According to the literature, the effectiveness of the process of learning and teaching skiing techniques depends on a number of factors, such as physical (including motor skills), mental (intelligence, personality, knowledge – the correctness of motor visualisations, motivation level, emotional states), tactical-material (teaching aids, equipment, environment, and surroundings) [Blachura, Lesiewski, Kunysz 2008]. Physical factors include sports aptitude, motor capabilities, and motor skills. Specific skiing conditions (natural environment, weather conditions, terrain) and the occurrence of slip could prove difficult for many beginners. Emotional states strongly influence the motor learning process. They are a kind of filter for environmental (physical, social) information, which limits the student's perception [Czabański 1998]. Emotions can affect information processing and the process of creating mental plans and programs. This is particularly true of anxiety, which can interfere with or even prevent learning [Koszczyc, Kowalska 1998; Wieczorek, Lesiewski 1998]. Learning and teaching skiing techniques is a deliberate process. In order to achieve the goal, the student's desire in this respect must be properly stimulated. This is done by appropriately selecting tactical factors to improve the effectiveness of teaching and ensure success. These tactical factors include terrain and its configuration, type of snow, ski runs, ski equipment, as well as teaching aids, such as equipment used on the slopes, traditional and modern textbooks, and technical teaching aids forming part of modern information and communication technology.

5. Summary

The task of the ski instructor is to create appropriate conditions, choose appropriate methods and aids to effectively teach the student the skiing technique. A methodology of skiing instruction is the specific way in which a given teacher works with students helping them to acquire the necessary knowledge, develop mental programs and finally master the target motor skills that they can then apply in practice. The methods answer the question of "how to teach", i.e. what activities and aids to choose in order to achieve the intended teaching results [Umiastowska 1998].

The processes of learning and teaching skiing techniques are cognitive processes. The ability to reproduce motor activity (e.g. angular widening turn) depends to a large extent on the existence of an internal representation of the movement that is created by verbal, visual, and kinaesthetic information received by the student. Because of that, it is very important to supplement demonstrations with verbal explanations using a variety of teaching aids to transfer information (including modern multimedia).

Multimedia textbooks can play an important role in the effective process of psychomotor education. They provide attractive and interactive forms of information transfer (e.g. description of the activity structure, demonstration, explanation of performance) that enable effective teaching and learning of motor activities. The use of a multimedia textbook can therefore help to create an internal representation of a motor activity, and an appropriate action program (motor schema). The multimedia textbook can play an important role in specialist ski instruction, where detailed information on motor activity is important (explanation of performance). The attractiveness and interactivity of movement information and the form of a multimedia textbook can have an equally significant and positive impact on learning outcomes in children and adolescents, where the level of motivation is an important factor. This aspect may prove important in students from Y and C generations ("digital natives"), including those with low physical activity or not physically active.

Most textbooks used for learning and teaching the skiing technique still have a traditional (paper) form. Some include a DVD with instructional material. Despite the available technologies, there is still a shortage of well-developed multimedia textbooks. From a practical point of view, using a multimedia textbook for teaching and learning skiing skills can have many benefits, including:

– multisensory transfer of information can effectively increase the level of knowledge about the proper performance of a movement (e.g. parallel turn) and the correctness of motor schemas (mental representations),

– a didactic video (real-time and slow motion) in a multimedia textbook with interactive photo sequences can be a perfect supplement to demonstrations made by the instructor on a ski slope,

– interactivity can increase student involvement, activity and motivation,

– the individualization of learning supports the teaching process in situations where it is not possible to organize lectures with big groups of students (e.g. ski courses in the mountains),

– depending on student needs, multimedia textbooks can be used on various devices: laptops, tablets, smartphones and distributed offline (e.g. flash memory) or online (e.g. cloud server, e-learning form).

Therefore, the use of multimedia education in the teaching of skiing can be an effective help in achieving good learning outcomes.

References

Adams G., 1992, Why Interactive?, *Multimedia & Videodisc Monitor*, March, 20-25.

Adams J.A., 1971, A closed-loop theory of motor learning, *Journal of Motor Behavior*, 3: 111-150.

Anderson J.R., 1998, *Uczenie się i pamięć. Integracja zagadnień*, Warszawa: WSiP.

Bednarek J., 2006, *Multimedia w kształceniu*, Warszawa: Wydawnictwo Naukowe PWN.
Blachura B., Lesiewski J., Kunysz P., 2008, Podstawy metodyki nauczania sportów zimowych, in: P. Kunysz (ed.), *Teoretyczne podstawy wybranych dyscyplin zimowych*, Wrocław: Wydawnictwo AWF.
Bodemer D., Ploetzner R., Bruchmüller K., Häcker S., 2004, Supporting learning with interactive multimedia through active integration of representations, *Instructional Science*, 33, 73-95.
Czabański B., 1980, *Model uczenia się i nauczania sportowych czynności motorycznych*, Wrocław: AWF.
Czabański B., 1998, *Wybrane zagadnienia uczenia się i nauczania techniki sportowej*, Wrocław: AWF.
Czabański B., 2000, *Kształcenie psychomotoryczne*, Wrocław: AWF.
Czajkowski Z., 2004, *Nauczanie techniki sportowej*, Warszawa: Centralny Ośrodek Sportu.
Czyż S., 2013, *Nabywanie umiejętności ruchowych. Teoria i praktyka*, Wrocław: MWW.
Doaa Abd El-Moneim, 2014, The Effects of Multimedia Computer-Assisted Instruction on Learning Basic Ballet Skills with Physical Education Students, *Physical Culture And Sport Studies and Research*, 63: 36-41.
Domagk S., Schwartz R., Plass J., 2010, Interactivity in multimedia learning: An integrated model, *Computers in Human Behavior*, 26: 1024-1033.
Dybińska E., 2004, Wpływ wyobrażeń motorycznych na sprawność nauczania i uczenia się czynności pływackich 10-letnich dzieci, *Antropomotoryka*, 27: 25-36.
Fitts P.M., Posner M.I., 1967, *Human performance*, Belmont: Brooks/Cole.
Gerrig R.J., Zimbardo P.G., 2012, *Psychologia i życie*, Warszawa: PWN.
Gracz J., Sankowski T., 2000, *Psychologia sportu*, Poznań: AWF.
Guła-Kubiszewska H., 1993, Wyobrażenia motoryczne a sprawność uczenia się pływania stylem klasycznym dzieci dziewięcioletnich, *Kultura Fizyczna*, 7-8: 22-26.
Gulińska H., 2012, Multibook nowym narzędziem nauczyciela, in: H. Gulińska (ed.), *Kształcenie chemiczne w dobie reformy edukacji*, Poznań: Wydawnictwo Sowa.
Hotz A., Weineck J., 1988, *Optimales Bewegungslernen*, Erlangen: Fachbuch Verlagsgesellschaft.
http://internetworldstats.com/stats.htm [accessed: 15.09.2019].
http://stat.gov.pl/obszary-tematyczne/nauka-i-technika-spoleczenstwo-informacyjne/spoleczenstwo-informacyjne/spoleczenstwo-informacyjne-w-polsce-w--2016-roku,2,6.html [accessed: 10.04.2017].
Jędryczkowski J., 2010, Film dydaktyczny jako komponent materiałów edukacyjnych w systemie kształcenia na odległość, in: J. Morbitzer (ed.), *Człowiek, media, edukacja*, Kraków: Wydawnictwo Uniwersytetu Pedagogicznego im. KEN.
Kameduła E., 2000, Edukacja i media w zreformowanej szkole, in: W. Strykowski, W. Skrzydlewski (eds.), *Media a edukacja*, Poznań: Wydawnictwo eMPI2.
Kerckhove D., 2001, *Powłoka kultury. Odkrywanie nowej elektronicznej rzeczywistości*, Warszawa: Nikom.
Koszczyc T., Kowalska B., 1998, Skuteczność działania w sytuacji trudnej osób o różnych umiejętnościach narciarskich, in: T. Koszczyc (ed.), *Dydaktyka wychowania fizycznego*, Wrocław: AWF.

Kupisiewicz C., 1994, *Podstawy dydaktyki ogólnej*, Warszawa: BGW.
Lesiewski J., 1995, Wyobrażenia motoryczne a sprawność uczenia się nowej techniki narciarskiej, in: T. Koszczyc (ed.), *Dydaktyka wychowania fizycznego*, Wrocław: AWF.
Magill R.A., 2007, *Motor learning and control. Concept and applications*, New York: McGraw Hill.
McMorris T., 2004, *Acquisition & performance of sports skills*, Chichester: John Wiley & Sons, Ltd.
Morbitzer J., 2011, Nowe media, nowy uczeń, nowa szkoła, in: S. Juszczyk, J. Ogrodnik, E. Przybyła (eds.), *Osobowość kompetencje powinności nauczyciela i wychowawcy*, Katowice: Wydawnictwo AWF Katowice.
Nęcka E., Orzechowski J., Szymura B., 2008, *Psychologia poznawcza*, Warszawa: PWN.
Nowak J.S., 2008, Społeczeństwo informacyjne – geneza i definicje, in: P. Sienkiewicz, J.S. Nowak J.S. (eds.), *Społeczeństwo informacyjne*, Katowice: Polskie Towarzystwo Informatyczne.
Okoń W., 2003, *Wprowadzenie do dydaktyki ogólnej*, Warszawa: Wydawnictwo Akademickie Żak.
Paivio A., 1986, *Mental representations: A dual coding approach*, New York: Oxford University Press.
Parnicki F., 1998, Wyobrażenia motoryczne w nauczaniu technik narciarskich studentek AWF, *Rocznik Naukowy IWFiS w Białej Podlaskiej*, 4: 95-101.
Petryński W., 2008, *Współczesne teorie uczenia się ruchów i sterowania nimi przez człowieka*, Katowice: Górnośląska Wyższa Szkoła Handlowa.
Pöhlmann R., 1985, *Motorisches Lernen*, Berlin: Sportverlag.
Prensky M., 2001, Digital Natives, Digital Immigrants, *On the Horizon*, 9(5): 1-6.
Puni A.C., 1975, Rola wyobrażeń ruchowych, *Kultura Fizyczna*, 6: 277-280.
Sankowski T., 2001, *Wybrane psychologiczne aspekty aktywności sportowej*, Poznań: AWF.
Schmidt R.A., 1991, *Motor Learning and Human Performance*, New York: MacMillan.
Schmidt R.A., Wrisberg C.A., 2009, *Czynności ruchowe człowieka. Uczenie się i wykonywanie w różnych sytuacjach*, Warszawa: Centralny Ośrodek Sportu.
Senge P., 2012, *Piąta Dyscyplina. Teoria i praktyka organizacji uczących się*, Warszawa: Wolters Kluwer.
Siemieniecki B., 2003, Multimedia i hipermedia w edukacji, in: J. Gajda, S. Juszczyk, B. Siemieniecki, K. Wenta (eds.), *Edukacja medialna*, Toruń: Wydawnictwo A. Marszałek
Siemieniecki B., 2007, *Pedagogika medialna*, Warszawa: PWN.
Skrzydlewski W., 1990, *Technologia kształcenia – Przetwarzanie informacji – Komunikowanie*, Poznań: UAM.
Small G., Vorgan G., 2009, *iBrain: Surviving the Technological Alteration of the Modern Mind*, New York: Harper Collins.
Steinbrink B., 1993, *Multimedia u progu technologii XXI wieku*, Wrocław: Wydawnictwo Robomatic.
Strykowski W., 1984, *Audiowizualne materiały dydaktyczne: podstawy kształcenia multimedialnego*, Warszawa: PWN.
Strykowski W., 1990, *Metody i środki kształcenia stosowane w szkole*, Warszawa: PWN.
Strykowski W., 1996, Media i edukacja, *Edukacja Medialna*, 1: 4-8.

Umiastowska D., 1998, *Lekcja wychowania fizycznego*, Szczecin: Wydawnictwo Naukowe Uniwersytetu Szczecińskiego.
Umiastowska D., 2001, Przygotowanie nauczycieli do realizowania zadań w zreformowanej szkole, in: J. Jonkisz, M. Lewandowski (eds.), *Kształcenie i wychowanie w zreformowanej szkole*, Wrocław: Wydawnictwo AWF Wrocław.
Umiastowska D., 2004, Nauczyciel w zreformowanej szkole – tradycjonalista czy nowator?, in: D. Umiastowska (ed.), *Nowoczesny nauczyciel w zreformowanej szkole*, Szczecin: Wydawnictwo Albatros.
Vester F., 2006, *Myślenie, uczenie się, zapominanie*, Bydgoszcz: Glosarum.
Walat W., 2004, *Podręcznik multimedialny. Teoria – metodologia – przykłady*, Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego.
Walat W., 2007, *Edukacyjne zastosowania hipermediów,* Rzeszów: Wydawnictwo Uniwersytetu Rzeszowskiego.
Wieczorek M., Lesiewski J., 1998, Wpływ lęku na zmiany sprawności narciarskiej osób dorosłych, uczących się jazdy na nartach, in: T. Koszczyc (ed.), *Dydaktyka wychowania fizycznego*, Wrocław: AWF.
Wiesner W., 1991, Film dydaktyczny w procesie nauczania czynności ruchowych, in: B. Czabański (ed.), *Uczenie się techniki sportowej*, Warszawa: AWF.
Wiesner W., Kunysz P., Bień W., Sabat U., 2010, Video Technology in Didactic Communication within Ski Education, in: M. Napierała, M. Szark-Eckardt, A. Kostencka, R. Muszkieta (eds.), *Pedagogy of health in physical culture*, Bydgoszcz: UKW.
Włodarski Z., 1996, *Psychologia uczenia się*, Warszawa: Wydawnictwo Naukowe PWN.
Zatoń M., 1996, *Podstawy narciarstwa zjazdowego*, Wrocław: Signum.
Ziemilski A., 1977, Eliminowanie lęku a skuteczność uczenia się narciarstwa, *Kultura Fizyczna*, 1: 31-35.

Kształcenie multimedialne w uczeniu się i nauczaniu motorycznym na przykładzie techniki jazdy na nartach

Streszczenie. Celem pracy jest identyfikacja wartości kształcenia multimedialnego oraz możliwości jego wykorzystania w procesie uczenia się i nauczania motorycznego. Praca ma charakter opisowy, opiera się na przeglądzie literatury i wynikach badań innych autorów. Zastosowanie narzędzi multimedialnych w kształceniu psychomotorycznym może zapewnić dobre warunki tworzenia wyobrażeń motorycznych i programu czynności ruchowych. Wykorzystanie kształcenia multimedialnego przez nauczyciela w nauczaniu narciarstwa zjazdowego może stanowić skuteczną pomoc w osiąganiu właściwych efektów przez ucznia.

Słowa kluczowe: uczenie się i nauczanie motoryczne, kształcenie multimedialne, podręcznik multimedialny, narciarstwo