

# Musical Literacy

*Michal Nedělka, Zuzana Selčanová*

**Abstract:** The paper characterizes musical literacy in the context of classification and other types of literacy and characterizes its basic components. It shows musically pedagogical concepts that have become the basis for the contemporary concept of musical literacy. It introduces musical literacy as a set of competencies that developed essential pedagogical directions especially in the 20th century and shows that literacy despite the pedagogical complexity and relevance of these directions has a complex character interfering with the component of knowledge and skills. It further recalls that the development of musical literacy is supported by a number of teaching texts, but that development is to a large extent dependent on the quality of teaching. The proficiency of music education requires interaction. The text also draws attention to the fact that the development of musical literacy and the contact of the individual with the music that is necessary for this process leads to the development of the emotional sphere of the personality, which at present is of utmost importance for the overall development of the personality. The contribution also points to the development of musical literacy in the current school, and highlights the need for adequate preparation for future music teachers.

**Key words:** musical literacy, musical abilities and skills, musicality, functional literacy.

## Introduction

Literacy, especially in terms of specific educational areas such as reading, numeracy, digital or financial literacy, is something that we have come to expect from current education. The term *musical literacy*, however, is not frequently used in relation to music education, at least not in the Czech Republic. All the more it seems the meaning of this term remains unclear. If we look at the content of music education more closely, we find elements

that can certainly be considered musical literacy, musicality, which includes musical abilities and skills, while knowledge of musical theory, aesthetics, history and understanding music as a listener or an active musician is secondary. This list of terms already shows that musical literacy is superior to musicality since it comprehensively covers more aspects of education. Different educational levels cover them at varying degrees whereby current music education practice focuses on activities – in other words a set of

skills. These do not, however, comprise all the competencies, which define literacy.

## Functional Literacy

Originally, the term *literacy* defined abilities and skills closely related to a person's practical life. The initial understanding of literacy in the sense of the ability to read, write and count has significantly expanded over time and various scientific areas come up with their own definition of literacy. There are several factors that affect literacy in schools. Kropáčková et al. (2018) for example cites that the development of literacies concerns all teachers and all subjects.

Niklesová and Bína (2010) point to a new attribute in literacy - so-called *modern literacy*. This type of literacy means being absolutely well-versed in various written and spoken modes of communication for example. The ability to distinguish important and unimportant information is also important as is the ability to be able to clearly articulate one's thoughts and ideas. Each individual modern superstructure of literacy uses a more narrow definition according to goal and subject. Today, we are speaking about literacy in the following areas: reading, visual, information, civic, literary, linguistic, ICT, natural science, mathematics, geometry, physics, internet, art, drama or music (Framework Educational Program for Elementary Education, 2017).

The content of the term literacy as such is based on history. In the past, a literate person was able to communicate with others especially through writing. The ability to mutually understand one another is no less important today, however, its narrow definition of reading, writing and simple arithmetic does not nearly cover today's demands. A person today is able to envelop a wide spectrum of activities, some of which were not even known in the past. According to Wieger (2007), understanding literacy moves to a broader definition in the form of so-called *functional literacy*. It can be said that, "*functional literacy represents a set of knowledge, skills and abilities needed for the life of an adult in modern society.*" (Kováčiková, 2002, p. 45). According to Rabušicová (2002, p. 18), "*a functionally literate person is able to participate in all activities where literacy is necessary for functioning efficiently in society.*". In the educational context, the issue of functional literacy is especially significant because it relates to knowledge and abilities needed for living and for an individual's capability to make responsible decisions on their life's direction.

## Literacy Research

Burdová and Matějů (1998) divide functional literacy into three components in the SIALS project National Report (Second International Adult Literacy Survey carried out in 1998 in the Czech

Republic as a second wave of the IALS research). They are defined accordingly:

1. *Prose literacy* – the ability to understand and make use of information obtained from written texts.
2. *Document literacy* – the ability needed to search and use information obtained from various types of documents (including job applications, payment slips, public transport schedules, maps, tables, charts etc.).
3. *Quantitative literacy* – the ability to work with numbers, to apply suitable mathematical operations to numerical data contained in printed texts such as charts, tables, as well as the ability to interpret this data. This e.g. includes filling in a purchase order, calculating tips etc. (Burdová & Matějů, 1998).

The IALS research project (International Adult Literacy Survey carried out internationally in 1994) was to prove that functional literacy is an important indicator of human capital, which cannot be replaced by the formal educational attainment indicator: functional literacy represents a continuum, which a person enters at a specific point according to the level of their ability to understand and work efficiently with specific information.

There are also several international comparative research studies with Czech Republic's participation. The RLS research (Reading Literacy Study, carried out in the Czech Republic in 1995)

focused on reading literacy; it examined 3rd and the 8th grade elementary school students. The TIMSS (Third International Mathematics and Science Study from the same year) research study also focused on these grade levels and examined the students' mathematical and natural science knowledge and skills. In 1999, the CivEd (Civic Education Study) research focused on examining civic education in 8th grade elementary school students and 3rd grade secondary school students. PISA research (from 2000) surveyed reading, mathematical and natural science literacy in children ages 15 and 17 as part of their reading literacy survey. In these questionnaires, students also stated how much time they spend on musical activities (e.g. playing a musical instrument, going to a concert etc.). The PPUČ (Supporting the Work of Teachers) project also draws attention to dealing with literacy across all school subjects. Teachers can share their observations on the development of literacy in various subjects in different grades on the <https://gramotnosti.pro/> online platform. Music education is missing here, however. The listed research studies do not focus on musical literacy as such but only touch on certain aspects of music education and do so only as part of other forms of literacies. The need to focus on musical literacy, which has its own potential to develop personality in terms of noetics, aesthetics and emotion is all the more apparent.

## Musical Literacy – Definition

Musical literacy is a term that is not frequently used in the Czech Republic (see Introduction) nor is it commonplace in scientific literature. We can still find texts, however, which deal with this term and define it. Čiháková's bachelor thesis (2017) explains musical literacy and surveys its level (in this case in older elementary school children). The author references conclusions of research studies surveying musicality in school-age children in the 20th century, which focused on the perception of music. Her conviction that perceiving music is a decisive aspect of musical literacy is based on these theories (Čiháková, 2017). Nevertheless, she finally arrives at the conclusion that musical literacy is a compound of knowledge, ability and aesthetic skill, in other words everything that good-quality music education should provide.

Composer, teacher and performer Kvěch (Kvěch, 2015) interprets musical literacy in more narrow terms, when he states that the first prerequisite for understanding a piece of music in terms of musical literacy is deciphering the musical score. Composer and teacher Tichý (1992) on the other hand points to the fact that musical literacy in terms of theory, historical contexts and even some musical abilities is not always necessary to ensure a good musical performance. He immediately adds, however, that a good performance without

the necessary level of musical literacy is based more on exceptional intuition that can easily fail. He therefore always considers literacy to be a prerequisite for a consistent level of musical performance. Samuels agrees, adding that without the necessary skills one cannot interpret and perform music at all. Admittedly, he means specific skills such as basso continuo, current chord names and symbols as well as historically informed performance (Samuels, 2000). Mills and McPherson draw attention to the ability to read music in the course of musical literacy development (similarly to Kvěch above). They also highlight the principles common to learning writing as a means of verbal communication (Mills & McPherson, 2015). The following statement from Samuels (2000) supports this notion of treating musical literacy as a prerequisite of communication: "Indeed, music contains all the basic elements of language. There is a musical syntax: the connection between melody, harmony, rhythm, and dynamics. There is even a grammar in music." (Samuels, 2000, p.56) Feierabend (1997) says something similar: "Development of musical literacy should follow much the same process as that which naturally develops in our own speaking, reading, and writing skills. In learning one's own language, one goes through five or six years when language skills are developed by ear-before reading and/or writing of language is introduced. This natural process instinctively enables one to communicate verbally with words and

later, after learning to read, to learn to write those thoughts". Samuels' statement on the indispensability of literacy for all types of active musicians supports the idea for a comprehensive understanding of literacy as a set of competencies: "You might find that you enjoy composing, arranging, conducting, improvising, producing, publishing, or teaching. All of these activities require an understanding of the language of music. The kind of analysis and practical application explored in this article is the first step in achieving musical literacy" (Samuels, 2000).

## Musical Skills and Abilities as a Component of Musical Literacy

It is apparent from the examples cited above that different experts understand musical literacy differently depending on their own expertise, in other words according to which knowledge and skills they consider paramount for their scope of activity. The listed examples deal with special music education, that is to say the education of a performer or a composer. In order to view musical literacy comprehensively, one must also consider the content and purpose of general music education. What does *music education* comprise from this standpoint? The term *concept formation* definitely falls in this area. Without a connection to actively performed or perceived music, musical terms remain

in the abstract realm. Comprehending them requires a complex development process and it is this understanding of the concepts and their usage according to their meaning that constitutes a level of musical literacy. For people, rhythm is the most comprehensible expression of music. Understanding rhythm has its roots in early childhood based rhythmic activities and singing, as well as later on, when a child begins understanding individual rhythmic values when playing simple musical instruments. A certain parallel with mathematics is apparent here. Rhythmic values correspond to the concept of a *natural number*. Initially, a natural number is not related to actual arithmetic and the same is true for the length of a rhythmic value (that is why rhythmic syllables are used in preparation for the development of rhythm as pre-school aged children can learn them more easily than exact rhythmic durations). Children learn how to count, multiply and divide rhythmic values later on in the first years of elementary school. Furthermore, we can compare tempo to a *fraction*. A child will gradually arrive at the term fraction as to a *rational number*. One tempo is twice as fast as another, while another is twice as slow and so forth. Understanding content and scope of a term is generally related to analytical thinking ability and this ability increases with the *development of abstract thinking*. The ability to work with abstract concepts affects the entire personality of a person (not only their intellectual

development). With this respect to this, however, Rabušicová (2002) points out that not all people fully reach this level of thought.

*Reading and writing* is another area covered by musical literacy. A musically literate person can read and write music and is able to use and work with it. Just as is the case with mathematical or reading literacy, this person is working with symbols. Imagining their specific expressions, that is to say the sound that they make, is much more difficult for most people than to do the same in writing, especially if we're dealing with several sounds or chords at once - three or more tones expressed in musical notation. This is why the ability to read or write the music for one voice, most often a song's melody is considered adequate in school music education.

The relationship between individual means of expression in a musical work, its analysis and understanding the mutual relationships in the musical work is all part of *functional thinking*. This generally means the ability to perceive relationships and understand their interconnections and the ability to interpret these phenomena. In music this relates to corresponding means of expression, their relationships and expressions, which can be found within these relationships.

The ability to *solve problems* includes creative activity in musical theory. This activity means active musical expression, choice of meter, tone, form, melody in an independent musical performance

as well as the option to accompany the given melody etc. These are tasks, which require the ability to form hypotheses, to find paths to solutions, to use different solution strategies and therefore the ability to think critically.

The area listed above is called *decision-making*. Besides creative and interpreting activities, it is also applied during the critical evaluation of a work and its creation. A person can use this as a basis to compare, evaluate and search.

An integral part of musical literacy is also the area of *application*. It is the application of knowledge in musical practice, which for a person who is not a musical professional means the use of musical activities in daily life - in various situations, on different occasions, repeatedly if need be.

The area of *communication* represents the ability to express one's thought on music, the ability of purposeful argumentation and supporting one's conclusions.

The given characteristics demonstrate that the areas of literacy mutually overlap in relation to musical literacy - the abilities and skills acquired and developed in other areas are naturally applied in musical literacy. It also definitely shows that a musically literate person knows more than to read music. We understand musical literacy on a much broader spectrum. Developed musical abilities, which can be classified in many ways fall within this spectrum. Several authors have done this, such as Těplov

or Michel but we consider Sedlák's classification to be most accurate (Sedlák, 1985):

- auditory perception abilities (understanding and working with tones, distinguishing tone characteristics, understanding relationships between individual means of expression - melodies, rhythm, meter and tempo);
- auditory ability and movement (ensuring the coordination of a movement between a body part and the auditory organ, for example moving one's hands while playing a musical instrument, etc.);
- analytical-synthetic ability (allowing for the perception of music, understanding it by affecting the means of expression and the relationship between its components as well as understanding form);
- rhythm (the ability to perceive timing in music);
- tone (the ability to notice tone, in other words the relationship between tone and the tonal center);
- harmony (the ability of consonance, dissonance, distinguishing chords and the ability to use chords);
- musical memory (the ability to recall previously heard musical forms);
- musical imagination (creating ideas and being able to work with them);
- musically intellectual abilities (musical thinking - the ability to use and understand music comprehensively including theoretic reflexion, aesthe-

tic perception and evaluation - the ability to assess quality, understanding content, musically creative abilities - creating new musical forms).

Besides musical abilities and based on the statements of Tichý and Samuels listed above, we also have to include knowledge in musical literacy - knowledge such as historical and musical theory, which are applied in musical activities.

Even though musical literacy is a term that only began to be used in the 21st century, it follows from the above that its dominant component is musicality, in other words the ability and skills that allow a person to adequately communicate through music and in music. This emphasis on a musically developed person was the main aim of music education especially in the 20th century. It related to a more narrowly defined expertise of a person with respect to individual aspects of knowledge and educational areas and activities that were supposed to provide adequate training for them. Sets of activities, which significantly supported the ability to perceive and feel music were used to develop musical abilities and skills. Swiss educator Émile Jacques-Dalcroze, for example, believed movement to be one of the instruments used to develop musical skills. He stressed the necessity of developing rhythm in his methodological concept (Jacques-Dalcroze, 1927). These mainly included all types of musical movement

connected to the life of a child and their musical experiences especially various types of dance. German educator and composer Orff was a big proponent of connecting music with movement and rhythmic expression. To this day, his set of simple instruments still provides an array of options to develop musical expression with rhythm as the crucial element. Orff emphasized that if we begin with developing musical ability and movement in the early stages of a child's development, we can significantly support their natural talent (Hurník & Eben, 1982). Hungarian composer and educator Kodály understood musical literacy as the ability to understand what we call musical notation, basically a type of reading literacy connected to reading out loud - while reproducing a text (Novotná, 2011). As was already mentioned, since the ability to recall tonal pitch when reading music is quite difficult, Kodály attempted to connect these recollections with so-called phonogestics. Simply put, this means that each tone matches an exactly defined hand movement (gesture). Phonogestics is still used today: a person can connect this gesture with their own singing (then the recollection of a sound is connected to a performed active movement) or a person can sing according to gestures performed by another person, for example a teacher (it is once again the connection of sound and movement but this time with an imagined movement and the option to use proprioceptive

afferentation, in other words impulses, which could lead to movement based on previous experience of a movement).

## **Knowledge as a Component of Musical Literacy**

Jiří Kusák (2006) highlights the role that knowledge plays in interaction with musical abilities and skills. He distinguishes the following components of the spectrum of knowledge necessary for the complete musical development of a person: *"The performance-knowledge component reflects the individual's level in terms of musical ability, skill, as well as knowledge, which are essential for performing musical activities (...)*

*The motivational-preferential component focuses on an individual's personality in relation to their interest preferences in musical style, genre, and music in general (...)*

*The axiological component refers to the internal emotional facilities and value orientation of an individual in the field of the (musical) arts.*

*The socio-cultural component supplements the relevant information with family background in terms of a musically stimulating environment" (Kusák, 2016).*

Similar to other types of literacies, musical literacy also requires knowledge apart from the components listed above. This is apparent when speaking about reading sheet music and the array of opti-



ons when singing this music. A person's first contact with music occurs in much the same way as first contact with a language based experience and is dependent upon activities, in other words skills. A musical score as a system of symbols eventually requires knowledge and is gradually required during modes of musical expression, in genres, styles where knowledge is important as well as an overview of history. The basics of musical literacy in this respect means knowledge of musicology: knowing how to write musical notation, understanding the relationship between tones, terminology, musical genres, styles. One can once again see parallels between music and language, where knowledge of the alphabet, grammar and syntaxes as well as literature is similarly essential. Musical theory developed in conjunction with music and it naturally changes and develops along with how music itself changes and develops. Development of musical theoretical knowledge is supported through several teaching texts, such as the basics of musicology, understanding harmony, counterpoint and musical forms. The same is true for the history of music, where the biggest problem, however, is always contemporary music which cannot be adequately captured in these texts. Texts for teaching musical theory and the history of music serve their purpose well in those areas where the quality of education is high – where permanent interaction between teacher and student takes place. These are mainly

teaching texts used to prepare students for a professional career as musicians or are used for the expert study of music. In general education schools, textbooks that contain selected areas of musical theory and music history are used. They contain musical score material (e.g. scores of songs and parts of compositions) as well as the ideas for musical activities but these are also reliant on professionally led teaching methods of a high quality. It is interaction, activity and performance that is essential for developing musical literacy. Operations, which take place do not have significance only for musical literacy but also contribute to the development of personality as such. Contact with music, as a listener, performer or creatively significantly contributes to the development of emotional aspects of personality.

## Conclusion

Musical literacy comprises a set of competencies, which enable a person to understand and actively reproduce music on various levels depending on the level and concentration of education. It is a prerequisite for a conscious and adequately qualified contact with music, which can become a person's lifelong passion thanks to a qualified development of this literacy. The fact that musical literacy is based on balance between knowledge and ability is an important aspect for this process, just as is the case when developing linguistic competen-

cies. The basics of developing musical literacy rest on music educational concepts of the 20th century, where these concepts are applied in current education on various levels. They mainly focus on the development of selected abilities and skills according to the preference of their authors and that is why in those instances they do not yet constitute musical literacy. Musical literacy can be seen in the comprehensive musical development of a person, who accepts music and understands it, is able to create or reproduce it, and has the necessary knowledge at their disposal. This complex reaches deep down of course and depends on the level and concentration of education as well as the preferences of the individual. Current music education

covers the listed components. In practice, however, the proportion of activities and knowledge depends upon the orientation of the teachers. All the more the proportional development of musical literacy depends on the good preparation of teachers and their interest in teaching their students to live a life where music is an indispensable, enriching and truly valuable component and a lifelong passion.

### Acknowledgments

This essay was written with support of the following Charles University Progres Q17 program: Teacher Preparation and Teaching Profession in the Context of Science and Research.

## References

- Burdová P., & Matějů, P. (1998). Jak lze zjistit funkční gramotnost? [How to Determine Functional Literacy?]. In P. Burdová, & P. Matějů. *Funkční gramotnost dospělých. Národní zpráva z projektu SIALS. Část 1. Hlavní výsledky.* [Functional Literacy in Adults. SIALS Project National Report. Part 1. Main Results.] Prague: Consortium Sou AV ČR and SCC&C, 23–47.
- Čiháková, K. (2017). *Úroveň hudební gramotnosti dětí staršího školního věku – sonda do současného stavu.* [Level of Musical Literacy in Older School Children – Determining the Current State.] Diplomová práce [Diploma Thesis]. Pedf UK: Praha. Available at: <https://is.cuni.cz/webapps/zzp/detail/163101/>.
- Jacques-Dalcroze, E. (1927). *Rytmus.* [Rhythm]. Praha: Průlom. Available at: <https://is.muni.cz/el/1421/jaro2008/DVT058/Jacques-Dalcroze-Rytmus.pdf>.
- Dostál, J. (2007). Informační a počítačová gramotnost – klíčové pojmy informační výchovy. [Information and Computer Literacy – Key Terms in Information Education.] In Dostál, J. *INFOTECH 2007 – Moderní informační a komunikační technologie ve vzdělávání, Díl 1* [INFOTECH 2007 – Modern Information and Communication Technologies in Education, Part 1], 60–65. Available at: [http://infotech.upol.cz/sbornik\\_INFOTECH07\\_dil\\_1.pdf](http://infotech.upol.cz/sbornik_INFOTECH07_dil_1.pdf).

- Holec, J. (et al.). (2018). *Využití Šablon II pro podporu rozvoje gramotností. Metodický text pro ředitele a pedagogy mateřských a základních škol. [Using Templates II for Supporting Literacy Development. Methodical Text for Principals and Teachers in Pre-schools and Elementary Schools.]* Praha: Národní ústav pro vzdělávání. Available at: <http://www.nuv.cz/file/3377>.
- Hurník, I., & Eben, P. (1982). *Česká Orffova škola I.: Začátky. Czech Orff School I: Beginnings.* Praha: Supraphon.
- Kováčiková, D. (2002). Funkčná gramotnosť ako negatívny fenomén súčasnej spoločnosti. [Functional Literacy as a Negative Phenomenon in Current Society.] *Mládež a spoločnosť: slovenský časopis pre štátnu politiku a výskum mládeže. [Youth and Society: Slovak Magazine for State Politics and Research of Youth.]*, 8(3), 44-50.
- Kusák, J. (2016) Recreational Musical/Dance Activities and Their Contribution to Shaping Musicality in Children and Adolescents. In Bernátová, R., Kania, S., & Śliwa, S., *Edukacja na rozdrożu.* Opole: Wydawnictwo Instytut Śląski (147-155). Available at: <http://pedagogika.wszia.opole.pl/ebook/enr3.pdf>.
- Kvěch, O. (2015). Smysl, cíl a metodologie výuky hudební analýzy skladeb. [Meaning, aim and methodology of music composition analysis]. In. J. Havlík, *Rozumět hudbě.* Praha : NAMU, s. 76-80. [cit. 25. 3. 2019]. ISBN 978-80-7331-376-0. Dostupné z: <https://namu.cz/rozumet-hudbe>.
- Niklesová, E., & Bína, D. (2010). *Mediální gramotnost a mediální výchova: studijní texty. [Media Literacy and Media Education: Study Texts.]* České Budějovice: Vlastimil Johanus.
- Novotná, M. (2011). Možnosti rozvoje hudebnosti a hudební gramotnosti současné české populace. [Possibilities of development of musicality and musical literacy of contemporary Czech population]. In Prof. PhDr. Jan Mazurek, CSc., Mgr. Silvie Schmuckerová. *Mezinárodní webový sborník hudební výchovy.* Ostrava : Pedagogická fakulta Ostravské univerzity v Ostravě. ISSN 1802-6540.
- Peirce, Ch. S. (1997). *Sémiotika. [Semiotics.]* Praha: Karolinum.
- Průcha, J. (1999). *Vzdělávání a školství ve světě: základy mezinárodní komparace vzdělávacích systémů. [Education and School Systems in the World: Basics of International Comparison of Educational Systems.]* Praha: Portál.
- Rabušicová, M. (2002). *Gramotnost: staré téma v novém pohledu. [Literacy: An Old Topic in a New Regard.]* Brno: Masarykova univerzita, Filozofická fakulta.
- Samuels, D. (2000) Achieving Music Literacy. In Percussive notes Indianapolis: Percussive Arts Society (p. 56-60 ISSN 0553-6502. Available at: [https://www.pas.org/docs/default-source/soundenhancedpdfs/achieving-music-literacy.pdf?sfvrsn=3724d4a5\\_2](https://www.pas.org/docs/default-source/soundenhancedpdfs/achieving-music-literacy.pdf?sfvrsn=3724d4a5_2)
- Sedlák, F. (1985). *Didaktika hudební výchovy I. [Didactics of Music Education I.]* Prague: SPN, 30-31.
- Tichý, V. (2002). *Úvod do studia hudební kinetiky: (k systematické hudebního rytmu, metra a tempa). [Introduction to Musical Kinetics: (to Musical Systematics rhythm, metre and tempo)].* Praha:

## MUSICAL LITERACY

Akademie múzických umění, Hudební fakulta. ISBN 80-7331-897-0.

Wiegerová, A. (2007). Přírodovedná gramotnosť ako súčasť profilu absolventa 1. stupňa ŽS. [Natural Science Literacy as a Part of the Profile of an Elementary School Graduate.] In J. Maňák, & T. Janík, *Absolvent základní školy: sborník z pracovního semináře konaného dne 20.-21. června 2007 na Pedagogické fakultě MU [Elementary School Graduate: A collection from the workshop that took place on June 20th and June 21st, 2007 at the Masaryk University Pedagogical Faculty]* (153–159). Brno: PdF MU, 153–159.

*Rámcový vzdělávací program pro základní vzdělávání [Framework Educational Program for Elementary Schools.]* (2017). Praha: Ministerstvo školství, mládeže a tělovýchovy. Available at: [www.msmt.cz/file/41216\\_1\\_1/](http://www.msmt.cz/file/41216_1_1/)

*Rámcový vzdělávací program pro základní umělecké školy [Framework Educational Program for Elementary Art Schools]* (2010). Praha: Výzkumný ústav pedagogický. Available at: [file:///C:/Users/ZUS/Desktop/PRM\\_RVPZUV\\_NAWEB.pdf](file:///C:/Users/ZUS/Desktop/PRM_RVPZUV_NAWEB.pdf).

**prof. PaedDr. Michal Nedělka, Dr.**

**Mgr. Zuzana Selčanová, Ph.D.**

Pedagogical Faculty, Department of Music Education

Charles University

[michal.nedelka@pedf.cuni.cz](mailto:michal.nedelka@pedf.cuni.cz)

[zuzana.selcanova@pedf.cuni.cz](mailto:zuzana.selcanova@pedf.cuni.cz)