



Analysis 2 – Curriculum readiness for teacher training

South Bohemia



„Virtual Reality for Education Network“ (VReduNet) is a project of the INTERREG VA Austria-Czech Republic program (Interreg ATCZ256).

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Preface

This analysis describes the current situation in the field of education of pedagogical workers, creates a comprehensive view of the educational system, educational plans, their current possibilities and their possibilities, all in the field of virtual and augmented reality. Information from this analysis can serve as an important basis for the introduction of new technologies in teacher education.

Description of the functioning of the pedagogical education system. How to become a teacher?

The system of teacher education is based on the implementation of accredited study programs carried out in undergraduate or postgraduate studies (further education of teaching staff). The length of the study, its structure and the level of education achieved correspond to the legislative requirements for teacher qualifications established for individual levels of schools.

In undergraduate education, the preparation of teachers for kindergartens is realized through bachelor study programs, the preparation of teachers for the 1st grade of elementary schools is an unstructured five-year master's study, and the qualification of teachers for the 2nd grade of elementary schools and for secondary schools is realized through a structured study, i.e. passing a bachelor's and subsequent master's studies. The standards of study programs are set by the framework requirements of the regulator of the teaching profession, which is the Ministry of Education, Youth and Sports (MŠMT). These standards determine the proportion of subjects of theoretical (specialist) training, subjects of a didactic focus, subjects of the pedagogical-psychological component and observations from practice.¹

In the system of postgraduate training, the starting point is the connection of already completed university training with a study in the field of pedagogical sciences or an additional pedagogical study. In the case of the qualification of teachers for kindergartens and for the 1st grade of elementary school, the condition for admission to study is the completion of a previous university degree in teaching or pedagogical programs. In this system, the qualification of 2nd grade primary and secondary school teachers is based on the de facto recognition of any focus of previous higher education. The structure of the study program then consists in the preparation of participants in a shortened model in topics focused on didactic, pedagogical-psychological areas and on observations from practice. The preparation of study programs is governed by the Study Standards in the field of pedagogical sciences for obtaining a teacher's qualification.²

If the optimal way to "become a teacher" is to be characterized, long-term undergraduate training with an emphasis on connecting the theoretical and practical components of training would be preferred. This moment is a prerequisite for the formation of the teacher's competences during the entire course of study as a reflective practitioner who is able to perceive what is happening in the educational process, how the learning processes of his pupils are taking place and what results he achieves in his educational work. The key to professional success and the initiation of lifelong growth is to internalize

¹Framework requirements for study programs, the completion of which provides a professional qualification for exercising regulated authorizations for teaching staff, <https://www.msmt.cz/vzdeleni/vysoka-skolstvi/ramcovne-pozadavky-na-studijni-programy-jejichz-absolvovanim-1>.

²Standard of study in the field of pedagogical sciences for obtaining the qualification of a teacher of the 2nd grade of primary and secondary schools, file:///C:/Users/Fyzika/Downloads/standard_DPS-1%20(1).pdf

the knowledge imparted so that it becomes part of the professional belief, and to replace (but not completely eliminate) intuition and improvisation with a reflective and thoughtful approach.

How are study plans and accreditations created?

Undergraduate studies

The right to implement a study program (admit students, teach, issue a diploma and a supplement to the diploma) arises on the basis of institutional or program accreditation of the study program.

The Council of the National Accreditation Office for Higher Education granted institutional accreditation to the only higher education institution in the South Bohemian Region – the University of South Bohemia in České Budějovice (JU) for the field of study in Teaching. This means that the higher education institution accredits study programs in the given field of education within its internal procedures and rules.

In addition to Act No. 111/1998 Coll., on universities and on the amendment and addition of other laws (the Act on Universities), as amended, there are minimum requirements for the quality of educational activities, resp. provision of the study program, established by Government Regulation No. 274/2016 Coll., on standards for accreditation in higher education and Government Regulation No. 275/2016 Coll., on areas of education in higher education, evaluation conclusions, recommended procedures and methods for evaluating the activities of the National of the Accreditation Office for Higher Education (NAÚ) as the main guarantor of the external evaluation of JU and the higher education environment in the Czech Republic in general, the JU statute, the Habilitation Regulations and the Order for the Appointment of Professors at JU, the Study and Examination Regulations of JU, the Rules of the Educational, Creative Quality Assurance System and related activities and Internal evaluation of the quality of educational, creative and related activities of JU (Rules), Standards for accreditation and realization of study programs of JU and related internal standards of JU and individual faculties.

Authorization to carry out a study program for a given type (bachelor's, master's, doctoral), form (full-time, combined or distance learning), standard duration of study and language of instruction is granted to one or more faculties by the JU Internal Evaluation Council (RvVH) on the basis of a proposal by the dean or a joint proposal deans of faculties until the end of the validity of the JU's institutional accreditation or for a period of 10 years.

The procedure for submitting, discussing and approving study programs, intentions to submit an application for accreditation, extension of accreditation or extension of the validity period of accreditation of study programs, intentions to submit an application for

institutional accreditation of an area or areas of education and for extension of institutional accreditation of another area or areas of education at JU are generally established in the Standards for accreditation of study programs at JU, which are part of the internal regulation, the Rules of the educational, creative and related activities quality assurance system and the Internal Evaluation of the quality of educational, creative and related activities of JU.³

The detailed procedure for the preparation and approval of study programs within the field or fields of education for which the JU was granted institutional accreditation, as well as for the preparation and approval of other study programs, is set out in the Standards for the Accreditation and Implementation of the Study Programs of the JU.⁴ In accordance with the Rules, a study program guarantor is appointed for each study program carried out at JU and a Study Program Council is established. Their task is to take care of the quality of the study program, to submit ideas for possible improvement of the teaching of individual subjects and to modify study plans.

In the case of the creation of study plans for teaching disciplines, the above-mentioned framework requirements of the regulator (MŠMT) are the starting point as a standard for a regulated profession, expressing an opinion on ensuring quality professional training of teachers by determining the optimal proportion between the so-called disciplinary, disciplinary-didactic, pedagogic-psychological component of preparation and practice. The preparation of the study plan is organized and ideologically supported by the guarantor of the study program. It proposes the structure of individual fields and their staffing so that it is in accordance with the stated standard, but also with the profile of the graduate of the study program. In terms of staffing, the guarantor consolidates the staffing of the fields with the opinions of the heads of departments or institutes so that, on the one hand, the capacities of specific workplaces are used, and on the other hand, the qualification and professional requirements for the guarantors of the fields of theoretical and profiling basis are observed. The created draft of the study program (with a defined structure of individual subjects, their staffing and a presentation of the graduate's profile) is discussed by the faculty management and then forwarded to the scientific council of the faculty for expert discussion. After incorporating the comments in the faculty's internal evaluation, the document is assessed by the university - the Council for Internal Evaluation. By approving and incorporating any comments, space is created for the preparation of a complete accreditation file and for its re-discussion both at the faculty level (Council of Study Programs, Faculty Scientific Council and Faculty Academic Senate) and at the university level. Depending on the nature of the accreditation (institutional or programmatic), the accreditation process is terminated either by the opinion of the Council for Internal Evaluation, or the material is forwarded to the National Accreditation Office for Higher Education. The entire accreditation process is therefore

³Rules of the educational, creative and related activities quality assurance system and internal quality assessment of the educational, creative and related activities of the University of South Bohemia in České Budějovice, https://old.jcu.cz/o-univerzite/dokumenty/internal_doc/pravidla-systemu-ensuring-the-quality-of-educational-creators-and-their-related-activities-and-internal-evaluation-of-the-quality-of-educational-creators-and-their-related-activities-ju-v-cb

⁴Standards for accreditation and implementation of study programs of the University of South Bohemia in České Budějovice, https://old.jcu.cz/o-univerzite/dokumenty/rectors_proceedings/platna-opatreni/2019/r_410_standarty_studijnich_programu.pdf

procedurally very complex, it includes several levels of decision-making and assessment of the quality of the study program proposal.

Study in the field of lifelong learning

The Center for Further Education of Pedagogical Staff was established at the Faculty of Education of the University of South Bohemia in České Budějovice for accreditation, organization and provision of studies in the field of lifelong learning. The center's staff prepared the accreditation of additional pedagogical studies, the completion of which can be used to obtain a teacher's qualification. The study program has its guarantor, who created the application for accreditation. It was discussed in the faculty's committees and after the approval of the faculty's management, it was sent to the Ministry of Education, Youth and Sports.

Additional pedagogical study is a study to meet the qualification requirements in the field of pedagogical sciences according to § 2 of Decree No. 317/2005 Coll., on the further education of pedagogical workers, the accreditation commission and the career system of pedagogical workers, as amended. This is a study in the field of pedagogical sciences to obtain the qualification of a teacher of the 2nd grade of elementary school and secondary school of a general education or professional subject, which corresponds to the nature of the previous study. The program is accredited by the Ministry of Education, Youth and Sports in the system of further education of teaching staff. The target group is graduates of an accredited master's degree program with a non-teaching focus (Mgr., Ing. - including graduates of linguistic fields), which corresponds to the nature of one of the subjects taught in primary or secondary school. Thanks to this study, they will acquire the competence to teach general education or professional subjects. Teaching takes place in three semesters with a time allowance of 254 hours in face-to-face and distance learning.

How can they be modified, who can do so?

Undergraduate studies

If there are any changes in the accredited study program during the validity of the accreditation, it must always be with the consent of the study program guarantor and after discussion in the Study Program Council. The quality coordinator at the relevant faculty must also be informed about these changes immediately. If it is a fundamental change, the JU Internal Evaluation Council must also be informed immediately.

There is no need to discuss changes in the accredited study program at the level of the parameters of a specific subject or a change in the current offer of mandatory-elective or optional subjects with the Internal Evaluation Council of JU; these are fully within the competence of the faculty's bodies established for quality assessment (Council of study programs or Doctoral Council, or the Faculty's Accreditation Commission). The quality

coordinator of the faculty informs the vice-chairman of the Internal Evaluation Council about other changes in the study program approved in the faculty's bodies established for quality evaluation, who submits an overview of the changes to the Internal Evaluation Council as information at least once a year. The Internal Evaluation Board assesses whether significant changes in the implementation of the study program, of which it is informed, will not cause the study program to cease to meet the relevant requirements. In such a case, it is entitled to reject the change and request a return to the original state, request adjustments to these changes or make other changes that will again achieve the fulfillment of the relevant requirement within the specified period.

Study in the field of lifelong learning

Minor adjustments to the study program are the responsibility of the study program guarantor. If these are fundamental changes, they must be reported to the Ministry of Education, Youth and Sports as an accreditation body in the mode of application for the extension of the educational program.⁵

Do the current curricula of future educators already contain some elements of virtual and augmented reality?

Within the study plans in the case of study programs in the field of *Teacher Training*, the Faculty of Education of JU offers the subject Technology in *Education*, which is common to all students of all study programs. The aim of the subject is to practically familiarize students with the possibilities of computer technology in the work of teachers and to equip them with the skills and competences of future teachers for the creation of teaching materials of a multimedia and interactive nature. Here, students are regularly introduced to both VR and AR. Students' iPads or smartphones are most often used to familiarize themselves with augmented reality. A 3D lab with two HTC Vive headsets is used to demonstrate VR. Due to the small capacity of the classrooms, the technology and the time allowance, the students really only get to know the technology and there is no room to go more in-depth.

What would be a possible procedure for the eventual implementation of VR/AR technology into the curriculum?

VR/AR technology can be included in the teaching of future teachers in the form of implementation in subjects of a common pedagogical-psychological basis (general didactics, personality and social development, general psychology for teachers, pedagogical communication, etc.), where the technology would primarily serve for the

⁵<https://www.msmt.cz/vzdelavani/dalsi-vzdelavani/prodlouzeni-akreditace-vzdelavaciho-programu>

possibility of simulating variants of situations, with which students can meet in pedagogical practice and can thus enrich theoretical knowledge with specific "real" situations in which they will combine it with practical skills, and which cannot always be planned in ordinary teaching practice lessons at schools. It can also be used to simulate the solution of possible disciplinary offenses by pupils, problem situations.

VR/AR can be involved in the implementation of the subject Analysis of Pedagogical Situations, which is currently directly focused on working with real situations at school. Situations from practice, selected by students, could thus be programmed into VR and the proposed solution could be verified within the seminar. Within psychology subjects, VR can be used to train teachers in communicating with students about serious topics (death in the family, etc.). VR can also be used to train future primary school teachers in recognizing the signs of learning and behavioral disabilities.

In addition to actual implementation of practice, VR/AR could be a suitable source of verification of methods and forms of teaching in practical school situations within subject didactics and methodical study subjects, according to the nature of the educational area (M, F, Aj, Bia under, always with regard to appearance and respect in FEP BE). In VR, a system can also be created for speech training of future teachers, focusing on voice work, eye contact, intonation, etc.

For the possibilities of a doctoral study in pedagogical psychology - research on how VR/AR can influence teachers' reactions in practice, to what extent it can simulate real situations that take place in school.

Other specific examples of VR/AR implementation possibilities in specific specializations (approval)

Mathematics

Stereometry: 3D space simulation and VR dynamics enable the recognition and detection of properties of three-dimensional objects and shapes. VR brings the possibility of direct interaction with the geometric properties of objects and is also suitable for combination with physical models. For the development of students' ability to perceive three-dimensional space, the possibility of creating a virtual environment of geometric shapes with which the user can interact is beneficial.

In financial mathematics, the potential lies in the possibility of simulating situations that develop and test the financial literacy of pupils and students. This option is now widely used by financial institutions to train their employees.

Physics

In physics, VR and AR undoubtedly have great educational potential. It involves both the implementation of virtual experiments and learning about phenomena and places that

are difficult for ordinary people to access, e.g. the universe, a particle accelerator, curved space, microscopic phenomena in matter related to the phenomena that pupils learn about, etc.

Technical education

VR and AR already play an important role in technical practice. It is mainly about preparation and training of complex production or service operations. However, the use of VR for 3D modeling of three-dimensional objects or environments is also real, whether it is design in the field of structures, residential architecture or the automotive industry. For the preparation of students in this field, the use of VR and AR is offered for virtual tours of any machines or equipment or entire production lines.

Geography

The possibility of including modern technologies, such as GIS, VR, AR, etc., in the teaching of geography in the 2nd grade of primary schools is very important. This is already a specific didactic application of the given field. This subject follows the teaching of geography for the 2nd grade of elementary school. If we go into details, then almost every subject within geography can be used for these technologies. Especially when preparing materials for teaching, understanding a more complex issue or getting to know a certain region.

Language teaching

For teaching English, German or Russian, it would be difficult to find any specific elements for VR or AR. However, even these technologies can be involved, especially in cooperation with geography, since the curriculum includes the realities of Canada, Ireland, German-speaking countries, Russia, etc. The aim of this course is to familiarize students with the basic geographical, cultural, social and political aspects of life in different countries with an emphasis on the practical use of this knowledge. During the lectures, students gradually become familiar with geographical areas (Great Britain and its smaller units, USA, Australia, Canada, former colonies, Germany, Austria, Switzerland, Russia, etc.) and work with texts, visual and audiovisual materials that they can also use during own teaching.

Natural history

In the bachelor's study program, the use of virtual (VR) or augmented (AR) reality is offered as part of the preparation of science teachers in the following subjects: Cellular and molecular biology; Biology of viruses and unicellular organisms in the context of the school curriculum; Geology I. and II. and Functional Human Anatomy. In cell and virus biology, VR and AR can be used to show students structures that are microscopic and generally difficult to imagine. In the case of geological subjects, students could familiarize themselves with the manifestations of internal or external geological factors through VR and AR. Human anatomy is generally a very suitable topic for the use of VR and AR, as it will provide an opportunity to gain insight into the structure of the human body, the

relative position of individual organs, their actual shape or size, etc. In subsequent studies, it would be possible to use VR and AR in the subjects of Physiology I and II., because they represent complex physiological processes from botany and zoology. VR and AR would certainly increase the clarity of the presented processes.

All these areas where VR and AR could be used are quite problematic even in the teaching of natural history in elementary school. A student who would encounter them as part of his bachelor's preparation could subsequently use them in his pedagogical practice and use them to convey the curriculum to pupils in elementary school.

Chemistry

As part of the bachelor's program for the preparation of chemistry teachers, there is the possibility of using VR and AR in the following subjects: Didactics of school experiments and Laboratory technique of chemical experiments. In the follow-up master's study, VR and AR can suitably supplement the teaching of the subject Basics of chemical technologies. In all these subjects, students may encounter more complex technological processes, laboratory procedures or tools that are not commonly available in laboratories at the university or are not used by any company in the area. VR and AR can help in the education of teachers (and subsequently in a very simplified form in the teaching of elementary school students) with a better illustration of chemical processes, such as substitution and elimination reactions in organic chemistry or the distribution of valence electrons in orbitals. When VR or AR is implemented in laboratory procedures, fine motor skills and work habits in conducting experiments can also be developed in this way.

Art Education

Within the framework of art education, it is very appropriate to use VR/AR, for example, in the so-called mediation of architecture, when the 3D model of the building enables a comprehensive and comprehensible interpretation of the principles of construction. It is also possible to work with the visualization of sculptural works for the possibility of a full spatial perception of the sculptural work.

Teaching for the 1st grade of elementary school

Areas focused on the study of nature offer the use of VR and AR in the subjects Man and his world I. - Inanimate nature and Methodology of natural science experiments, Man and his world II. – Living nature and Didactics of learning about nature, Natural science research and work with natural resources and Regional natural science. VR and AR offer the possibility to demonstrate more complex experiments (again together with the development of fine motor skills and mastery of work procedures) or to visit different habitats where students (and therefore pupils) cannot easily get to, or to observe animals and their behavior. In Regional Natural Sciences, students (and pupils) could get to know localities in their surroundings without the need for complicated travel to the given locality, or it would be possible to present materials in direct connection with the curriculum (without the need to follow the seasonal aspect).

Teaching practice

In general, it is possible to consider the use of virtual reality as part of the continuous practice of teaching students, where students could become familiar with interesting moments in the classroom and propose their own solution to the pedagogical situation (in this case, however, long-term preparation will be necessary, including making recordings and creating an adequate virtual environment).

Is there a possibility of more systematic training of existing teachers in the field of VR/AR?

VR/AR can be used in the education of existing teachers as part of the Additional Pedagogical Studies and in DVPP courses (third subject) - qualification enhancement, in the field of general and subject didactics to give students a better idea of the methods and forms of teaching in primary and secondary schools. VR/AR can support the theoretical framework by demonstrating the practical implementation of theoretical teaching principles.

For DVPP students, especially beginning teachers, VR/AR can also be used to practice problem situations with students that they may encounter in practice.

In the case of the offer of continuing education courses for teaching staff, it is also possible to create a specialized short-term course accredited by the Ministry of Education, Youth and Sports in the DVPP system.

However, there are also fundamental problems associated with the potential development possibilities of VR/AR in the preparation of future teachers and within the DVPP. Higher involvement of VR/AR in teaching also entails higher demands on technical equipment. Currently, several units of VR headsets are available at the Faculty of Education of JU. For effective use, at least model class VR is required, which means about 17 glasses and at the same time the need for sufficiently large spaces. The second obstacle to a more massive deployment is the absence of teaching materials, procedures and models. There are a number of applications of a game nature, but there is a lack of quality didactic materials, both at the level of the Faculty of Education of the JU and the Czech education system. However, the creation of these materials already requires greater knowledge of technology, programming and testing.

The above-mentioned possibilities of implementation into the curriculum can be realized provided that the teachers of individual subjects/courses are able and willing to master these technologies. This places additional demands on educational institutions, as experience in the academic environment with the involvement and use of these technologies is scarce, as is the case in primary and secondary schools in the South Bohemian Region.