

# DIYLab in Teacher Education

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One of the components of the EU project DIYLab1 was the implementation of DIY activities into the university education of the students of pedagogy. The DIYLab project, among other things, sought to change the concept of teaching and to achieve a turnaround in the approach to learning and teaching practice through a pedagogical approach based on the idea of DIY. For the preparation of future teachers, the pedagogical approach with DIY elements means an important shift in the view of the learning process and the teaching of the young generation so that it is motivated to address real complex problems. In the context of teacher training, there is still a present issue of how to properly prepare students for their future profession so that their teaching practice reflects modern trends in education and, at the same time, is not separated from the real state of schools in organisational, curricular, social and technological terms. Beginning teachers not only try to bring modern and innovative approaches to teaching, but also attempt to integrate these approaches into educational practice in line with the traditional approaches of their colleagues and to interconnect them.

Significant aspects of the DIY approach in teacher training include: (1) the possibility of a deeper thorough assessment of students' work and subsequently a better understanding of their way of learning; (2) a way to look for new themes for the students' work so that it is meaningful in the context of both practice and out-of-school activities and at the same time in line with the curriculum; (3) preparation for the new role of a teacher in student-centered approach to learning with an emphasis on self-regulated and autonomous learning while applying problem-based and inquiry-based learning. The DIY approach offers teachers a way to contribute to the development of digital literacy of pupils even in such cases where the teacher does not have sufficient competencies in the respective area. Future teachers should be prepared to apply elements of the DIY approach in varying degrees of complexity in the planning, implementation and evaluation stages.

The DIY activities implemented within the framework of the study of teaching at the Faculty of Education in Prague were designed according to a common general methodology (Jeřábek et al., 2016) similarly as for other university studies. However, the approach to their realisation and especially the reflection was specific. In the case of future teacher training, students are expected to have a certain level of pedagogical competence, the ability to critically view the learning process, and a certain degree of reflection in teaching and learning, even at Bachelor's degree level, where the teaching of specialised subjects is prevalent.

# 1. The concept of DIY approach at Bachelor and Master degree students in the field of teaching

One of the important aspects that must be taken into account when integrating the DIY approach into university education of teachers is the specialised knowledge and competence of future teachers. In university teacher training, this is *the professional knowledge* of the field (in the case of future ICT teachers, the knowledge of ICT, informatics and computer technology, i.e. information theory, mathematical logic, programming, algorithmisation, computer systems and networks, communication technologies, web and mobile technologies, processing of text, image and multimedia information, database systems, etc.), and also *didactic competencies* in the context of the given specialisation. At the Faculty of Education, the acquisition of specialised knowledge is typical for the Bachelor's degree and requires students to have attained a certain level of specialised knowledge and skills. It is then possible to develop their didactic competencies with the teaching of the respective educational area (teaching subject) at elementary and high schools. Developing competences with specialised fields combined with didactics is unthinkable without a thorough knowledge of the field. The educational approach of the teacher to the subject, which students have to learn, depends on the ability of the teacher to grasp the content of the subject, which is not possible without the thorough knowledge of the field.

## Bachelor's degree studies

Within the EU project DIYLab, analyses have been carried out to identify key issues encountered in the teaching of specialised subjects of Bachelor's degree studies in the field of teaching.

The first problem is the ***lack of motivation of students*** to actively approach learning. Most DIYLab research educators have pointed out that students are more likely to passively receive information and learning material from a teacher without their own active search for deeper knowledge or verification of information. Students often rely only on information provided by teachers. They do not themselves create a basic knowledge base for the given issue and the subject is lacking a critical view; they do not strive for a deeper and more comprehensive understanding of the problem; they are satisfied with the basics necessary for passing the subject. Students find it difficult to differentiate crucial information from marginal; they fail to recognise the core of the subject, and are often dependent only on the information received in the course. We encounter this phenomenon not only in theoretical but mainly in practical subjects in which students are not willing or able to actively and independently solve unexpected situations in their own projects in order to achieve greater quality, make the procedures more effective or find even better solutions.

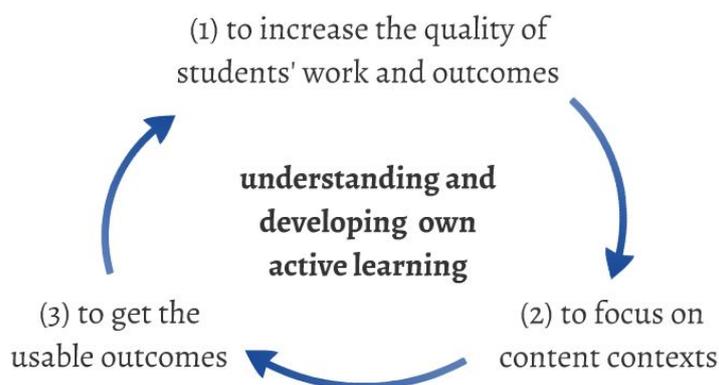
The second problem is the ***"false" interest of students*** in the subject and the subject matter. A student's interest in the subject and the activities required in the course are based on

personal efforts to meet the learning requirements for the given subject, i.e. to learn the subject matter in order to be able to obtain credits, pass an exam or to prepare term papers at such a level and with such quality that is still sufficient and acceptable to the teacher, even though it may not correspond with the student's vision.

The third problem is related to **students' perception of the learning process** and the subsequent approach to their own learning, in which, according to students, the reception of information directly from the teacher dominates. The reason for this idea can be (1) the habit transferred from high school, (2) experience with the predominant traditional transmissive lectures at the university, (3) the convenience of students and the effortlessness of such approach, (4) the experience and belief of students the what they need, they will learn themselves outside of school.

In the context of the study of education, we consider insufficient (in many cases even absent) reflection and understanding of one's own learning process as a major problem. The ability of reflection and self-evaluation is an important requirement for the development of lifelong (self-) learning and teaching skills. For follow-up Master's degree studies, which are focused primarily on the development of didactic and pedagogical competencies of future teachers, it is important for students to be able to identify needs, strengths and weaknesses of their own learning processes, and then translate these experiences into methodology and assessment of teaching in their own teaching practice. At the same time, students need to understand the importance of an active approach to learning and to develop that competence.

When integrating the DIY approach, respectively the specific DIY activities in teaching in the Bachelor's degree studies, there was an effort to conceptualise the courses in such a way as to minimise the aforementioned problems. In addition to the six key educational principles of DIY activities (collaborative learning, inquiry-based teaching and learning, trans-disciplinary knowledge, digital competence, curriculum-relatedness, autonomous/self-regulated learning), there were three objectives to focus on (see Scheme 1), all of which should contribute to understanding the meaning of students' own active learning during university studies.



*Scheme 1 - The essence of incorporating DIY into teaching within Bachelor's degree studies.*

The usefulness of the outputs of DIY activities (3) lied primarily in the concept of seminar and project work in such a way that their outputs could primarily serve other students or other people interested in the subject for the purposes of their own study (education). University students did not meet such an approach very often (at most on social networks or student sites). Outputs are no longer addressed "only" to the teacher as in a seminar, but can serve other people as inspiration or guidance. This forced students to think more about outputs in contexts related to the target group and their meaningful use, and consider the clarity and availability of the output. The usability of DIY outputs is closely related to the quality requirements (1), both technically and in terms of content. The third important point is to focus on the content of the topic (2), not only on the technical / technological aspects. When the students are working with digital technologies (DT), the aim is to make them focus on the content and to understand that using DT is a possible way of handling the problem rather than the primary goal of the activity.

## Master's degree studies

Within the DIYLab project, analyses were carried out at the Faculty of Education to help identify key key issues related to the teaching of didactic-centred subjects of Master's degree studies in the field of teaching. In the Master's degree studies, we approach the DIY implementation in teacher training as (A) a model demonstration of a didactic issue of how to develop digital literacy of students, as well as (B) shaping the pedagogical competence of teachers, how to develop students' ability to learn, how to record the process of students' learning and then evaluate it.

At Master's degree level, the teaching of future teachers focuses on subject-based didactic issues. It is assumed that students - future teachers - already have sufficient expertise in the field so that they can, during didactic subjects, concentrate on pedagogical approaches to teaching subjects corresponding to the specialisation of each student, on current and prospective topics of their field in the context of educational requirements in the 21st century, including digital literacy and the competence with learning-to-learn.

### *Digital literacy*

The first issue that needs to be addressed when implementing DIY in Master's degree studies is to clarify **what we mean by the concept of digital literacy**. Students of education are convinced that they have a lot of experience with ICTs, because, every day in virtually all their activities, they use it while most of their teachers do not use digital technologies too sophisticatedly, that the school does not develop their ICT literacy, that they take no advantage of the fact that practically every ICT skill is self-taught outside of school and that the most important thing is to master the technologies (software and hardware). There are exceptions, but many students do not pay much attention to the connections between the

technology and the content. Digital technology is just a medium of content that can be quickly replaced by new technology - a new medium.

Integration of DIY into school education allows focus, to a varying extent, on shaping all 21 partial competencies of digital literacy of students defined in DigCOMP2.0 (Vuorikari et al., 2016). Incorporating DIY activities can thus become a meaningful integration of digital technologies into school education, not just an opportunity to use them in the sense of 'the Difference Between Technology Use And Technology Integration'. The concept of digital literacy cannot, however, be understood as a definitive list of ICT knowledge and skills, as is the case with DigCOMP2.0, but as a literacy that "involves more than the mere ability to use software or operate a digital device; it includes a large variety of complex cognitive, motor, sociological, and emotional skills, which users need in order to function effectively in digital environments" (Eshet-Alkalai, 2009, p. 93). Improvement of digital literacy in the context of a holistic conceptual model means to focus on "the following cognitive skills: photo-visual digital thinking, reproduction digital thinking, branching digital thinking, information digital thinking, socio-emotional skills, very quick or almost instantaneous thinking" (ibid.).

School outputs of DIYLab activities may not be in a digital format at all costs; the most important result of DIYLab student activities is the instruction and explanation of the student(s) as to how they proceeded with DIYLab activities; such a tutorial can be in the digital form of a website, a blog, animation, audio, video, annotated presentations, digital photo gallery, etc. Students have a lot of experience sharing such tutorials, for example, thousands of them are currently on YouTube. In order to be able to describe their procedures in digital form, they need to be able to work with digital technologies (for example, to create websites, to work with a digital camera, to process animations, to edit digital photos).

### *Learning-to-learn*

DIY is closely related to the concept of learning. There is a popular view and an expectation that digital technologies can significantly help people learn. Research around the world warns that today's young generation is spending a lot of time with digital technologies, but the way they are used is often far from what we might call learning. It turns out that students often do not know how to effectively use technology to learn, to prepare for school and that teachers do not teach students how they can learn-to-learn with digital technologies (Pivec, 2017).

"Learning-to-learn may be defined as the ability and willingness to adapt to novel tasks, activating one's commitment to thinking and the perspective of hope by means of maintaining one's cognitive and affective self-regulation in and of learning action." (Hautamäki et al., 2002, p. 39) The pillar of the skill of a person of learning-to-learn are Context-Related Beliefs, Self-Related Beliefs and Learning Competences, whose integral part is Self-Evaluation (Hautamäki et al., 2002, p. 38). Learning competence can be divided into four main categories: "the learning domain, the reasoning domain, the management of learning, and affective self-regulation" (Hautamäki et al., 2002, p. 42). However, each of us uses their own model of how

to teach teaching. In the Master's degree studies, we are addressing the issue of how to measure these models of teaching with future teachers. And the DIY activities using self-reported self-evaluation can serve as a tool for exploration and follow-up evaluation of the effectiveness of model of learning-to-learn. Visualising the solution to the problem in DIY activities can "help students design and self-direct their own learning pathways" as in SAMR (see *Using The SAMR Model To Frame How To Teach With Apps*).

## 2. DIY implementation in teacher education at Master degree level

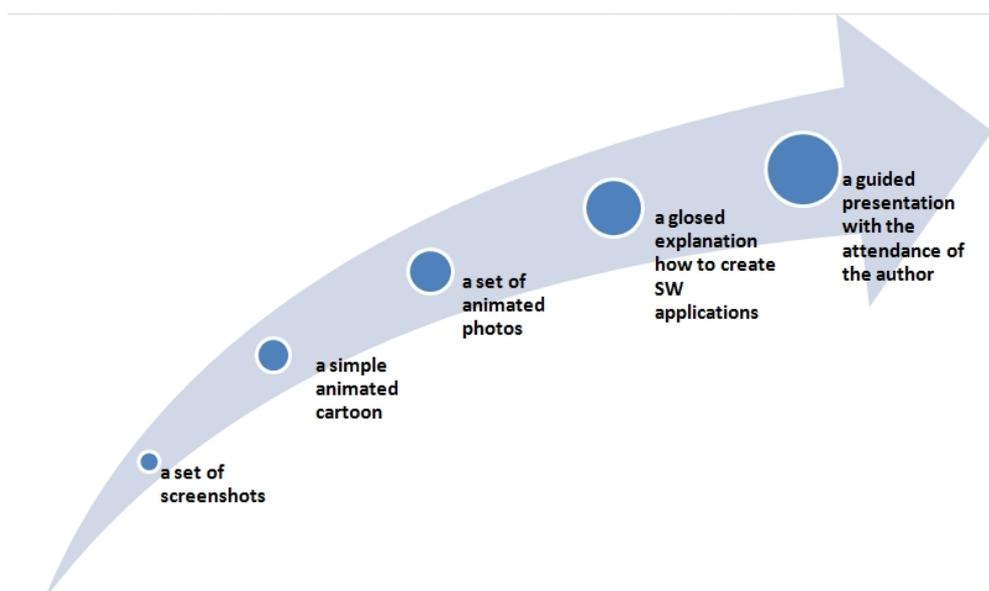
In the process of the integration of DIY in teacher education at Master degree level, it was necessary to initialise interdisciplinary collaboration among students and academic staff of the Faculty of Education, to extend and diversify portfolio of pedagogical approaches to students, to prepare students for their new role in the teaching profession associated with pupils' DIY activities and to teach student teachers how to monitor the learning process of their pupils, and, in assessment, to turn their attention primarily to the learning process, and not only on the learning outcomes and artefacts produced.

In the didactics courses, the student teachers of the Faculty of Education practise some DIY activities while acting in the role of pupils. These DIY activities are not concentrated on selected topics of school curriculum, but on themes related to their university study (e.g. joint production of a collection of problems which people cannot solve without using digital technology) with an accent on interdisciplinary overlap.

Applying the DIY process in education reveals big differences in the choices and creative approaches between full-time and part-time student teachers and how they understand and grasp the DIY concept. Among part-time student teachers there are usually many graduates of different HEI who have a lot of experience within a variety of professions in the job market – in IT companies, Art industry, libraries, different roles and positions in (health) services or in technical branches, and also as (unqualified) teachers of varied school subjects in schools – and who strive to exploit, as much as possible, their knowledge and acquired experiences. A degree of helpfulness to collaborate in teamwork is another specific different approach of Master student teacher to DIY. The full-time students meet together significantly more often during a semester, therefore, they are not so motivated to collaborate in teams, whilst part-time students who commute to the Faculty of Education from across the Czech Republic collaborate intensively; they are very much together in DIY activities (usually using Moodle or SKYPE). Another substantial difference among both group during implementation of DIY – both part and full-time Master degree student teachers – consists in that practically all part-time students work in schools as (unqualified) teachers struggle immediately to apply in their teaching practice with the pupils' knowledge and experiences acquired in didactic courses

including the DIY ideas; examples of DIY activities created by their pupils are utilised as methodical / teaching materials for other Master's degree student teachers.

Both groups – full and part-time Master degree students – are confronted with the same problem which we meet also within DIY activities with students at Bachelor level: how to visualise a learning process. This problem was, partly, caused due to a fact that when we started to implement DIY into teacher education student teachers had no examples of DIY activities which could inspire them as to how to record their own learning process in DIY activities using technologies for visualisation. There was another factor which keeps students from finding methods how to keep a record and share their procedures – during their study the students had never meet such an assignment, even as student teachers in didactics courses within topics focused on formative assessment etc. Thus, the first attempts to record a learning process in DIY had a shape of a set of screenshots following how students used computer applications. The next attempt was to try to visualise a learning process using a set of photos; in such cases it emerged that students separate a content (information) which technology / photos as media enable communicate (see Scheme 2) from such technology; students do not dedicate to their content analysis, they do not pay any attention to coding a story, process, facts, emotions, time, relations in each photo. As it turned out for example in DIY activity “How I’m becoming a teacher” ICT student teachers were not able to present so much information and stories within animated photos as student teachers of Art education.



*Scheme 2: Ways how student teachers learned gradually how to visualise a process of DIY activity solution*

The DIY philosophy can be implemented in teacher education at Master degree level within didactics courses in this way:

1. Theoretical explanation of DIY philosophy as a didactic concept in the context of learning-to-learn competence
  - 1) Explanation of fundamental pedagogical terms: learning, self-regulated learning, auto-reflection of own learning, autonomous learning, informal learning, inquiry based learning, co-operation and collaboration, teamwork, interdisciplinary relationship, cross-curricular relations and collaboration.
  - 2) Digital literacy specification further to formation and development its fundamental components in accordance with a digital literacy definition published in the document DigComp 2.0 (Information and data literacy, Communication and collaboration, Digital content creation, Safety, and Problem Solving).
2. Ways and solution for Learning Assessment, primarily formative assessment: e-portfolio, story-telling about how to do it, ways how to visualise learning process, assessment of artefacts vs assessment of processes.
  - 1) Examples on HUB DIYLab ([hub.diylib.eu](http://hub.diylib.eu)) and their didactical analysis
    - i. Inspiration
    - ii. What to do better? What can we utilise for a design a new DIY activity? What may be improved /modified or changed? What can be transferred into school education in the Czech Republic?
  - 2) DIY activities design and their solution and realisation in teacher education:
    - i. Target group: student teachers
    - ii. Theme: focused on issues studied in teacher education
    - iii. Application of six principles for DIY activities: (1) to support inquiry-based learning, (2) co-operation and collaboration of all participants who are involved into DIY activity, (3) integral part of current curriculum, (4) interdisciplinary relationship, (5) self-regulation learning, and (6) digital literacy improvement
  - 3) Assessment and evaluation of DIYLab projects by other student teachers
3. In addition (especially for part-time students, if it is applicable): To apply the DIY teaching approach in teaching practice with pupils in schools

### 3. Pedagogy for teaching approach to DIY in school practice

The didactics for a teaching approach to the DIY in school education is based on a concept of active autonomous, self-regulated learning and on the idea to link pupils' valuable after-school activities which pupils enjoy very much, in which they are happy and through which they learn and discover a real world, which currently the school ignores and does not connect to the school curriculum.

To implement DIY into school education means:

- To motivate pupils for DIY activities (e.g., You will design materials and aids for your young schoolmates and their teacher to make learning fun and entertaining. Your DIY activities will be useful. Everybody knows many things and has expertise).
- To support pupils in teamwork (e.g., In teamwork you can do more and better things.)
- To motivate teachers and parents to be involved and with collaboration of teachers, parents and their children it is possible to identify appropriate and interesting problems for DIY activities which pupils engage out of school in their free time, which pupils enjoy, but which at school they have not realised yet and which could be integrated into the school curriculum (e.g. parents have a mouse farm, their children help parents with the farming of mice for biology / medical laboratories, the Academy of Science or the zoo; the children know far more about the life and behaviour of mice and in so much more detail than they could learn in school Biology)
- To support interdisciplinary / cross-curricular links, to involve teachers of different school subjects in DIY activities and to inspire them to collaborate
- To help pupils to use digital technology for visualisation and record what they learn and how they solve DIY activities and for publishing instructions / manuals how to solve DIY activities, on YouTube, DIYLab HUB etc., to learn how to share and to share.
- In collaboration with all teachers to propose criteria on how to assess pupils' learning and the work carried out in DIY activities.

## 4. Conclusion

The experiences gained in the EU project, "Do It Yourself in Education: Expanding digital competence to foster student agency and collaborative learning (DIYLAB), EACEA (Education, Audiovisual and Culture Executive Agency), KA3 ICT Programme, 543177-LLP-1-2013-1-ES-KA3-KA3MP" has persuaded us that the DIY philosophy has great didactic potential to improve the learning of the young in schools, that it makes sense to implement DIY in school education, and, therefore, in teacher education, it behoves us as teacher educators to pay great attention to DIY: its philosophy, principles and practice.

## Resources

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- Using The SAMR Model To Frame How To Teach With Apps*. Available at <http://www.teachthought.com/the-future-of-learning/using-samr-model-frame-teach-apps/> (in English)