

REFLECTIVE EDUCATIONAL PRACTICES IN THE TRAINING OF STUDENTS, FUTURE TEACHERS OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

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Abstract. This study presents reflective educational practices as an effective tool for professional development in the field of education. It analyzes the need to develop reflective skills in students who are future teachers. The article focuses on basic models for the formation and development of reflective skills, examining the characteristics and concepts involved in their application. Special attention is paid to reflective practices in the training of students, future teachers of computer science and information technology.

Key Words: *reflective skills, reflective practices, computer science and information technology training.*

Introduction

A teacher's reflective skills are a key component of their professional competence and personal development. The basis of a teacher's professional reflection is a comprehensive and in-depth understanding that the teaching profession is socio-pedagogical in nature – teachers shape all aspects of their students' personalities. The relevance of the study stems from the need for effective training and professional development of reflective skills in students, future teachers, and in this work we refer to students of computer science and information technology. They are expected to form and develop skills for systematically reflecting on their own experience, to apply innovations in teaching, to evaluate the effectiveness of teaching strategies, and to modify them accordingly. The professional development of teachers requires the formation of reflective skills in teaching and assessment.

The need to develop reflective skills in students, future teachers

In the modern educational process, reflection, self-assessment, and self-reflection have become some of the key skills for personal development and professional growth. They refer to the teacher's ability to comprehend, analyze, and improve their own practice by learning from their experience and adapting their approaches to the needs of students and the context of learning. Teacher reflection is a conscious process of thinking about one's own teaching practice, through which teachers analyze their actions, experiences, results, and interactions with students for the purpose of professional improvement and better teaching. Teachers with a reflective teaching culture have an advantage in times of rapid change.

A number of studies emphasize the important role of teachers as key stakeholders in the development of contemporary strategies in the educational process [1, 2, 14, 18].

Reflective thinking is a priority in the development of modern teaching methods, as the ability to know oneself and to subject one's mental and practical activities to rational and critical analysis is a prerequisite for any purposeful self-development and self-improvement. Quality education requires learners to engage in different types of reflection, but it is particularly important for teachers to place students in appropriate situations that stimulate their reflective abilities. The main task of the teacher is to make their students responsible for the results of their learning and to guide them towards the need to accumulate individual cognitive experience.

Sava Grozdev's research on preparing outstanding students for participation in academic competitions also contributes to the pedagogical aspect of reflection. Reflection as a physical concept means reflection; the direction in which reflection acts is clearly defined. In relation to the innovative processes in education resulting from contemporary educational requirements, the unidirectionality of reflection, according to Grozdev, is not sufficient: "Above reflection stands self-organization, which, stimulated by reflection, drives creativity and innovation" [8].

Reflection is the basis for successful learning for both teachers and students. Developing reflection skills in students and teachers is an important task in education at all levels and across all subjects. The competencies gained through reflective practice create a strong foundation for continuous improvement in teaching and learning. Achieving high standards in teaching has the greatest impact on student achievement. Moreover, the effect of reflective teaching and the promotion of reflective practice in schools benefits not only individual teachers but also education as a whole.

Reflective educational practices – basic concepts

Reflective practices are an effective tool for personal and professional development, especially in the field of education and self-learning. They promote awareness, critical thinking, and learning from one's own experience. This is essential for effective continuing professional development and the development of highly qualified teachers.

In the world pedagogical theory and practice, “reflective teaching” is increasingly becoming necessary. Models of reflective educational practices are being created, which are the result of the development of psychological sciences and new didactic approaches [17]. We believe that teaching students to develop reflective skills is an important process that must be developed systematically. The main goal is the purposeful and active development of reflective skills in students training to be teachers and their mastery of models for reflective analysis and self-assessment. Reflective skills are accumulated and developed during the learning process and represent a complex system of knowledge, skills, attitudes, feelings, emotions, self-control, self-development, and self-assessment. Reflective skills must be built upon with each subsequent stage of purposeful reflective learning.

We will present basic models for the formation of reflective skills and the implementation of reflective practices in the educational process with their characteristics and features in their application.

John Dewey and Donald Schön provide the basic ideas for a general understanding of reflective practice in teachers. One of Dewey's greatest contributions to psychological science is the identification of five stages that can be used to describe reflective thinking: 1) a sense of difficulty; 2) defining it and setting boundaries; 3) identifying possibilities (hypotheses) for solving the problem; 4) developing through reflection on the relationships between ideas; 5) observations leading to acceptance or rejection, i.e., achieving certainty or uncertainty [3]. For Dewey, one of the main goals of different educational practices is to help learners – students or pupils – develop the ability to think reflectively. According to him, reflective practice is based on teachers' past experience, their knowledge, and making reasonable decisions about their teaching.

Donald Schön bases his work on that of Dewey, introducing two main types of reflection – “reflection in action” and “reflection on action”. According to him, reflection in action takes place during the action itself – while the teacher is teaching, observing the students' reactions, and adapting their behavior in real time. Reflection on action takes place after the action has been performed – the teacher analyses how the lesson went, what was successful and what could be improved [13]. According to Schön, what matters in teachers' professional practice is not so much factual knowledge as the ability to reflect on the

experience gained. This requires teachers to make decisions about their future teaching experience based on their understanding of the past. According to Schön, it is not factual knowledge that matters in teachers' professional practice, but rather the ability to reflect on acquired experience. This implies that teachers make decisions about their future teaching experience based on their understanding of the past.

David Kolb developed a model for "learning through experience" or known as "Kolb's Cycle" [10], consisting of four steps: 1) concrete experience (feelings) – personal experience or a new situation that triggers learning; 2) reflective observation (reflection) – thinking about the experience; 3) abstract conceptualization (thinking) – building or modifying concepts based on observations; 4) active experimentation (action) – applying new ideas in practice to test their effectiveness. Learning through experience is closely related to learners' ability to reflect on their actions, i.e., to engage in reflection.

In 1988, Graham Gibbs developed a model [7] to present the step-by-step process of reflection. Due to its cyclical nature, this model is particularly suitable for repetitive actions, allowing learning and planning from things that either went well or did not go well. Gibbs' cycle consists of six steps: 1) description – encouraging a clear description of the situation, what happened during the event, without making any judgments or conclusions; 2) feelings – analyzing feelings to understand the psychological impact of the situation; 3) evaluation – did the teacher handle the situation well or not; 4) analysis – justifying actions based on one's knowledge; 5) conclusion – how did the teacher handle the situation and what could be improved in the next lesson; 6) action plan – based on the previous steps, the teacher creates a plan to improve their work in a similar situation in the future.

The ALACT model, proposed by Franz Korthagen [11], is used to reflect on professional practice, especially in teacher training. The process of reflection, as a restructuring of experience and knowledge, is described as a cyclical model in five steps: 1) action; 2) looking back at the action; 3) awareness of key aspects; 4) creating alternative methods of action; 5) testing, which is in itself a new action and therefore the starting point of a new cycle. In her study, Todorova adapts the ALACT model as a method for developing reflective skills in students in the process of their Information Technology (IT) education [16].

Later, Korthagen and Vasalos [12] expanded Korthagen's ALACT model by focusing on personal reflection, linking professional development with personal growth. This model, called the "Onion Model", shows different levels that can influence how a teacher functions.

The authors present a model consisting of six layers, arranged from the outside in: 1) environment – external circumstances – the opportunity to examine the challenges faced by teachers; 2) behavior – action – the way they deal with

challenges; 3) competencies – skills – what competencies they possess and how they resolve challenges; 4) goals – beliefs and attitudes – what they believe in; 5) identity – sense of self – who am I, the assumptions teachers make about themselves; 6) mission – life goal – what inspires them to pursue this profession. Unlike traditional reflection, which often focuses on the teacher's behavior and skills, including not only actions and thoughts, this approach pays attention to internal values, emotions, and identity. Teachers can understand the true meaning of a situation only when it touches them personally, allowing them to explore themselves as teachers.

Thomas Farrell developed a model [5] that combines all aspects of reflection – the intellectual and cognitive aspects of teaching practice and the non-cognitive aspects of the teacher's emotional state prior to their activity. The model consists of five levels: 1) philosophy – reflection on previous situations and past experiences; 2) principles – reflection on concepts of teaching and learning; have these concepts been transferred into real practice during the lesson? 3) theory – preparation before the lesson regarding the lesson plan, learning activities, choice of teaching methods for the lesson; 4) practice – from the actions of the learners, they can conclude whether their actions are in line with the reflection on the principles and theoretical stages; 5) beyond practice – examining the influence of social and moral issues on the teacher's practice in the context of teaching.

Each teacher must decide which model is appropriate for a particular situation, bearing in mind that different models stimulate different levels of reflection: the Gibbs cycle is suitable for teachers who lack sufficient reflective skills, while the Farrell and Korthagen-Vasalos models are recommended for teachers who are familiar with reflective practice.

Reflective educational practices in the training of students, future teachers of computer science and information technology

When training students studying to become teachers in the bachelor's and master's programs at the Faculty of Mathematics and Informatics of the “Paisii Hilendarski” University of Plovdiv, special attention is paid to the formation and development of pedagogical reflective skills, which are the basis of the practical competence of student teachers. The aim of the training is to construct one's own knowledge and transfer it to new situations, as well as to activate reflection on one's own experience. To develop the reflective skills of teachers (students training to be teachers), we focus on methods of control and self-control or assessment and self-assessment in teachers' activities.

When the reflective process is directed toward one's own professional activity and, in particular, toward its technological procedures (rather than its content parameters), toward the assessment and selection of well-mastered professional skills related to the nature of the professional task, then reflection is

undoubtedly professional [9, 19]. According to studies by a number of authors [6, 19], on various manifestations of reflection and the professional profile of teachers, we believe that three reflective skills are of interest: **self-observation**, **self-assessment**, and **self-improvement**. Self-observation enables critical analysis of pedagogical activities. It is a mechanism for developing a new pedagogical skill – pedagogical observation. Self-assessment relates to the core of the professional personality and is an important regulator of its behavior. The level of development of self-assessment determines the application of opportunities for the development of professional knowledge and competencies. Self-assessment provides great opportunities for a complete characterization of the process of self-improvement and lifelong learning. In [4], the authors consider self-assessment as a basis for the development of personal qualities and professional-pedagogical competence in future teachers by solving a set of learning tasks and completing questionnaires for self-assessment and self-analysis. Self-improvement is a personally significant process. It is a way of achieving self-improvement, which is constantly expanding and enriching through pedagogical communication over the years, with an interest in building on professional skills in cognitive terms.

When teaching students who are training to become teachers in bachelor's programs, as well as teachers in master's programs at the Faculty of Mathematics and Informatics of the "Paisii Hilendarski" University of Plovdiv, special attention is paid to independent work. The aim of teaching students is to construct their own knowledge and transfer it to new situations, to stimulate reflection on their own experience.

The concept of reflective practice is widely used in digital learning environments, both for learners and teachers. When students self-teach using reflective assessment, they think about how their work meets the established criteria, analyze the effectiveness of their own efforts, and plan for improvement. Reflection is linked to elements that are essential for meaningful learning and cognitive development in students: developing metacognitive knowledge and abilities – the ability to self-learn and self-assess [15]; improving their ability to think about their own achievements and pace of development; the ability to self-assess – to evaluate the quality of their work based on evidence and explicit criteria in order to improve their work; development of critical thinking, problem-solving and decision-making skills, improving the teacher's understanding of the learner.

All this necessitates that teachers be trained to organize the educational process in a learner-centered manner, applying modern methods of active learning based on actions, game-based learning, projects, discussion, dialogue, observation, etc.

Conclusion

Teacher training programs emphasize reflective practice, as contemporary society requires teachers to constantly change and develop their teaching methods effectively in order to meet the needs of diverse contexts by critically reflecting on their own teaching and learning practices. Teachers should view learners as active participants in their own learning, rather than passive recipients of knowledge.

The ability of students, future teachers, to carry out their teaching activities with a reflective approach demonstrates their professional competence, successful coping with different situations, as well as creative and adaptive application of different forms of teaching practice aimed at sustainable professional development.

Acknowledgments

The first author is supported by the FP25-FMI-010, “Innovative interdisciplinary research in Informatics, Mathematics, and Pedagogy of Education”, of the Scientific Fund of the “Paisii Hilendarski” University of Plovdiv, Bulgaria. The second author was financed by the European Union-NextGenerationEU, through the National Recovery and Resilience Plan of the Republic of Bulgaria, project № BG-RRP-2.004-0001-C01.

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