ACTION-ORIENTED COMPETENCE DEVELOPMENT IN ELEMENTARY SCHOOL: PROPOSAL FOR A PRAGMATIC OPTIMIZATION OF LEARNING PRACTICE USING THE EXAMPLE OF AN ENRICHMENT PROJECT IN THE SUBJECT PHYSICS

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ABSTRACT

The demand for action-oriented teaching is becoming an essential part of school education in the present day. Action-oriented teaching is an alternative teaching method to the frontal teaching mostly used in Germany. In particular, in action-oriented teaching, the teacher should no longer design and reflect on the lessons alone, but students should actively participate in shaping the lessons. The teacher carries out practical activities with the students so that the students can present the experiments at the end, reflect on them and reproduce them on everyday things. Two research questions arose for skill building in the enrichment project. First, the question of whether purely action-oriented teaching/learning methods enable students to achieve such an increase in competence that they can even grasp the learning material of the lower secondary level of a Gymnasium. The German curriculum from the federal state of North Rhine-Westphalia (NRW) for the subject physics served as a basis. The second research question is to examine whether two teachers (subject advisors and learning process facilitators) have an added value in terms of learning quality. Due to the consistent application of theoretical principles in the classroom and the analysis of questionnaires at the end of the project, both research questions could be answered with "yes". Furthermore, the eight participating students found the lessons with two teachers more valuable than with only one teacher. The overall result was that the students were fascinated by the concept of independent experimentation with consistent reflection.

Keywords: Handlungsorientierter Unterricht, Begabtenförderung, Enrichment-Projekt, APO-Modell, John Dewey.

1 INTRODUCTION

Enrichment programs are used in particular in gifted education, where students are taught separately to enable them to build up competencies in specific subject areas. In this case, the curriculum from the physics subject in grade 5/6 of the Gymnasium was prepared in such a way that it could be used in the 3rd grade of a state elementary school.

The basis is the curriculum of the state of North Rhine-Westphalia (NRW) from Germany. From the point of view of educational policy, there were two essential aspects to deal with this topic. On the one hand, all federal states of Germany are engaged in the promotion of giftedness with the task of the educational system to provide all children with education according to their abilities (Bund-Länder-Kommission, 2021).

On the other hand, the federal state of North Rhine-Westphalia explicitly emphasizes in its legal guidelines that "every young person has a right to school education, upbringing, and individual support without regard to his or her economic situation and origin or gender" (Ministerium für Schule und Weiterbildung NRW).

At the time of the study (2011), NRW was clearly in the lower range of the PISA studies. Of the 16 states, NRW ranked 14th in science, 13th in mathematics, and 8th in reading and text comprehension (IPN - Leibniz Institute for Science and Mathematics Education, n.d.).
These results showed that an improvement of the educational system - especially in NRW - was needed. In reality, it became apparent that only a few schools in Germany actually provide support for the gifted. Often, gifted education consists of skipping a grade or enriching additional learning material. The latter can lead to frustration among school children, as they do not understand how to work "harder" than their classmates.

The individual support of gifted children, requires a significant additional effort for teachers and is therefore little used. In addition, there is a lack of knowledge about gifted school children, as this topic of (high) giftedness is not a focus of education in Germany. But as the PISA studies show, many students have a deficit in science, mathematics and language skills.

The most commonly used teaching style in German schools is frontal instruction, even though this has been critically defined in educational science for years.

The goal should be action-oriented teaching in order to address and adequately support all students. This means consistently teaching students tools, methods and applications that enable them to work independently and on their own responsibility.

The pragmatic approach according to Dewey (Schäfer, 2005) and the model of work process oriented competence acquisition (APO model) of the Fraunhofer Gesellschaft (Bauer; Brater; Büchele; Dufter-Weis; Maurus; Munz 2006) served as guiding principles for the project carried out.

This led to two research questions. First, whether through a purely activity-based teaching, students of the 3rd grade level can be taught such a competence build-up that they can understand and reproduce the learning material in the subject physics of the 5/6 grade level. The second research question analyzed whether two teachers acting as learning process facilitators and subject advisors added value to the students.

2 Methods

For the investigation, some preliminary work had to be done first. The theoretical basis is shown in the following table:

Theory	Requirements
Communicative interaction pedagogy according to Dewey	1. Practical activities are in the foreground and not pure book knowledge 2. primary and secondary experiences 3. implementing educational lessons and inquiry learning 4. make reference to everyday life

	(Schäfer, 2005)
APO-Modell	1. use learning process facilitators and expert advisors 2. use real work tasks for independent thinking and solving 3. let explanations take place only after practical action 4. students should obtain information by themselves 5. mistakes are allowed, they serve as learning opportunities 6. teachers stay in the background, observe and are available for questions 7. allow many correct solutions 8. reflect regularly 9. have students document and present (Bauer; Brater; Büchele; Dufter-Weis; Maurus; Munz, 2006)
Competence and competence development	Concept according to the framework curriculum NRW (Ritterbach Verlag, 2007)
Cooperative learning	1. use planned actions that lead to positive interdependence. 2. have students take responsibility for themselves and others 3. use team-building activities to promote group interaction, group cohesion, and trust 4. teach social skills 5. students take on different roles 6. observe group and give feedback (Weidner 2008)

The requirements and learning objectives of this project resulted from the connection between content-related and methodical learning, the competence development via independent, action-oriented learning through method, communication and team training. The students learned to work routinely and thoughtfully, to plan, organize, research, structure, communicate, present and operate. Further, the teaching of physical phenomena took place through activity-based instruction and the use of a subject advisor and a learning process facilitator. A physicist with a doctorate supported the project as a subject advisor and the author acted as a learning process facilitator. Based on the curriculum of North Rhine-Westphalia in the subject physics, the two teachers designed the content-related topic areas including the curriculum competencies to be acquired. This resulted in the topics of electricity, temperature and energy, and light and sound.
In addition, each teaching sequence was designed with regard to the theoretical principles mentioned above and the competencies to be achieved. The following illustration of the "Light" teaching sequence is intended to make it easier to understand:

Learning objectives	Students are able to... ...handle a laser pointer responsibly ...explain the straight-line propagation of light
Structure/Procedure "Reflection" "Joint reflection/discussion"	Reflection/discussion about past UEs Division into learning tandems Have students conduct experiments Students reflect in their learning tandems Show picture of human eye and address danger of laser beam

	Conclusion: Joint reflection/discussion on the experiments
Material needed	5 laser pointer, chalk, blackboard, blackboard sponge
Development of process-related competencies according to the curriculum	**Competency Area Knowledge Acquisition:** **E-1, E-2, E-4 (experiment only), E-8, E-10.** **Competency Area Communication:** **K-1 through K-5, K-7, K-8.** **Competency Area Evaluation:** **B-1, B-3, B-4, B-5**
Building concept-related competencies according to the curriculum	**Competencies for the basic concept "Interaction":** **Image formation with the straight-line propagation of light**

Content fields	Content area "Light and sound - Light and vision - Light sources and light receivers - Straight-line propagation of light Content field "Optical illusion - Structure and image formation in the eye • - Function of the eye lens
Professional contexts	Technical context "Optics helps the eye". • Making the "invisible" visible with optical instruments • Fiber optics in medicine and technology

Unfortunately, not all of the topics listed in the learning plan could be implemented in the project, since these various materials were not available at an elementary school.

During the implementation of the activities in the experiments, the know-how transfer happened through the subject advisor. The learning process facilitator made the acquisition of competencies transparent to the students by documenting the work process in a portfolio. In this portfolio, not only the technical acquisition of competencies was recorded, but also sketches and experimental procedures.

For the students' self-evaluation, a competency grid was developed with predefined learning objectives and competencies for the individual subject series. This self-assessment enabled the teachers to identify any competence deficits and address them accordingly.

The focus was on allowing the children to experiment autonomously and document their results in the portfolio, then discuss and finally reflect on them. The children acted as their own "researchers" and learned about physical phenomena through their own actions.

The subject advisor and the learning process facilitator acted as "advisors" and provided "help for self-help." This approach is crucial that it was not the teachers who solved the students' activity tasks, but that they supported the students in finding solutions.

3 Results

From the evaluation of the students' questionnaires, it can be concluded that they were able to internalize and reproduce physical phenomena of the secondary level I of the Gymnasium through the activity-oriented lessons.

Teaching with two teachers (subject advisor and learning process facilitator) was also evaluated entirely positively by the students and seen as an added value. In particular, the students emphasized that an advisor was always immediately available to answer questions.

The selection of physical topics at the high school were suitable for the students and did not overtax them. This was evident, not only in the active classroom activities and portfolio work, but also at the summer festival, where they independently demonstrated the individual experiments to the audience.

The evaluation of the parents' questionnaires was also positive. All students had achieved learning gains, so they reported on the experiments at home (in keeping with Dewey's communication pedagogy) and also presented them to their parents.
Looking back on the two research questions, both could be answered with "yes".

4 Discussion

The difficulty of acquiring action competence via activities that the students could not yet master at all is described conclusively via the pedagogical paradox according to Rothe (2008):

"One learns actions by doing what one first wants to learn. One teaches actions by putting teachers in situations that they are learning to master."

From this emerged as an important reflection the need for teachers not to leave students alone, but to accompany them in their learning processes.

Each lesson was designed according to a predetermined process:
Brainstorming Experimenting Portfolio Work Presenting Reflecting.
The learning process facilitator and the subject advisor supported the students with possible questions.
The lessons were authentic and corresponded especially with the students' everyday experiences. Due to the real-life teaching of competencies, the students' learning was experienced as meaningful.

The active activities promoted information absorption, information processing and information reproduction in the students.

Traditional forms of learning and teaching, as in the current German education system, are no longer sufficient overall to meet the demands of the globalized and accelerated world. It is therefore necessary to provide students with methods and tools at an early stage so that they can later succeed in their professional lives.

In the course of the discussion about lifelong learning, everyone has to continuously improve his or her qualifications, especially in later professional life. If there is a reluctance to learn, this is often due to the unsuitable learning methods used, which do not so much build up action competencies as produce retrievable knowledge.

Teachers need to move away from rigid and boring instruction to action-oriented teaching.

5 Conclusion

The project carried out has shown that the learning content of the 5th/6th grade of the Gymnasium in the subject of physics can be imparted to children in the 3rd grade by means of offerings at elementary schools in Germany alone through the application of purely action-oriented teaching/learning methods. The methods used are based on the communicative interaction pedagogy according to Dewey and the model of work-process-oriented competence acquisition (APO model). In addition, the use of two teachers in the roles of "learning process facilitator" and "subject advisor" proved to be purposeful. These two key findings provide a basis for sustainably optimizing learning outcomes for students in German elementary schools.

"Show me, and I'll remember. Let me do, and I understand."
(Confucius, c. 551-479 B.C.)

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