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Pursuant to article 13 paragraph 1 of the Act of 14 March 2003 on Academic Degrees and Title and Degrees and Title in Art (consolidated text: Journal of Laws (Dziennik Ustaw) of 2017, item 1789), a doctoral dissertation should constitute an original solution to a research problem, and the candidate in a given scientific discipline should demonstrate general theoretical knowledge and the ability to independently conduct scientific work.

On the other hand, in accordance with section 6 point 4 of the Regulation of the Minister of Science and Higher Education of 19 January 2018 on the detailed procedure and conditions for obtaining a doctoral degree, in habilitation proceedings, and in proceedings for the conferment of the title of professor (Journal of Laws, item 261), the review report shall include a thoroughly justified evaluation of whether the doctoral dissertation meets the conditions specified in article 13 paragraph 1 of the Act of 14 March 2003 on Academic Degrees and Title and Degrees and Title in Art.

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This is a review report on the doctoral dissertation authored by Ms. Michal Sigron, entitled *Learning to Become a Physics Inquirer: Environment, Process, and Challenges*, written under the supervision of Prof. dr. hab. Stanisław Dylak, scheduled for public defence at the Faculty of Educational Studies, Adam Mickiewicz University in Poznań, Poznań 2021; no. of pages 406 (pp. 427 inter alia with the summary - excluding the unnumbered pages, the list of numbered tables I, II, III, etc.).

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In accordance with the Resolution of the Scientific Council of the Discipline of Pedagogy of Adam Mickiewicz University in Poznań dated 23 March 2021, commissioning me to prepare an evaluation of the doctoral dissertation in question, I have thoroughly read the text submitted to me.

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### **Preliminary reflections**

Teaching, as well as - more broadly - education, resembles reality in that its proper value is assessed in particular through experiencing its deficit. This concerns both the qualitative-existential fact experienced by the subjects of educational life, as well as social groups, educational institutions, and socio-political structures, which are after all characterised by the presence of specific people, principles, and forms of conduct. This also concerns analysis, thoughts, interpretation, or intellectual reflection on educational and socio-cultural situations, phenomena, and images. The individual, social and institutional dimensions of education (teaching and learning) that I have in mind relate to both dimensions presented above.

Locating education in man's socio-cultural space and regarding it as an object of discovery, cognition and realisation speak in favour of directing the pedagogical discourse around mutually permeating areas of society and education. Accordingly, one should ask the following questions:

- what is the essence of education (teaching and learning process) and is education really of value for contemporary society/man?
- how does a person (including the teacher) perceive, value, feel and react to all education-related phenomena (teaching and learning processes)?
- what is the background of global transformations occurring in the broadly understood sphere of social and economic life that determines changes in education, redefining the traditional perception of the teaching process?

Drawing attention to this issue through discussion or empirical research is justified, but not easy. The fact of addressing this issue in the reviewed dissertation is legitimate, bearing in mind the pedagogical (social) point of view.

The dissertation entitled *Learning to Become a Physics Inquirer: Environment, Process, and Challenges*, submitted for review by Ms. Michal Sirgon, MA, and written under the supervision of Prof. dr hab. Stanisław Dylak, is an interesting and intriguing project. It attempts

at a comprehensive, holistic, interdisciplinary, multidimensional approach to and understanding of processes and relationships, as well as at a reconstruction of complex and dynamic social and educational phenomena, including learning/ teaching subjects of educational life/ pupils (also in the diagnostic and dependence perspective). Thus, the dissertation conforms with the specificity of pedagogy as a scientific discipline (in particular, its sub-disciplines and areas of knowledge, such as didactics and pedeutology). On the one hand, the Doctoral Student competently seeks to build up knowledge on subjects' intellectual activity, including didactic and psycho-social consequences of such activity; and on the other hand, enriches the practice by building up and deepening educational and social awareness of the activities based on this knowledge. Although numerous inter-, transdisciplinary, and multidimensional studies on intellectual activity (learning/teaching, didactic process) exist, the reviewed dissertation can testify to the importance of learning and changing everyday, among others, school and academic socio-educational practices.

The analysis of the reviewed dissertation resulted in remarks and observations (of a debatable, polemical nature), which I take the liberty to present following *my own* agenda of evaluation.

At the outset, I would like to highlight the somewhat novel grasp of the problem explored - among other things, in terms of determining (the level of) pupils' development related to how they perceive the experience and challenges of inquiry.

Simultaneously, I wish to emphasize that in her theoretical and research explorations the Doctoral Student undertook issues essential (of practical significance) in the broadly perceived school and socio-educational practice. These are in particular:

- firstly, enriching scientific knowledge about, on the one hand, the intellectual activity of the subjects of educational life, and on the other hand, among others, about the intellectual development of young learners;

- secondly, presenting analyses, conclusions and generalizations on the ways in which pupils perceive their own development when it comes to experiences and challenges related to performing various inquiry components within the "Research Physics" programme.

- thirdly, emphasising the topicality of the idea and concept of intellectual activity and the value of science (in a life-long perspective) in the school, academic, and social dimensions.

Undoubtedly, the results of the presented systematisation, including the formulated generalisations, theoretical conclusions, and research explications, are particularly noteworthy due to practical, social and deeply humanistic implications of the undertaken issues. These issues are of socio-educational utility, they determine the use of knowledge, results of analysis and reflections, among others, in the practical, school, and academic dimensions of conscious and organised action.

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### **Evaluation of the dissertation**

The dissertation comprises 406 pages (427 including the list of contents, etc.). It is a well-organized logical whole that consists (within the identified division of the content) of the introduction, six chapters, bibliography, as well as the lists of figures and of tables. Given the substantive content of the work, such a division is justified.

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In the dissertation, the Doctoral Student distinguished three leading areas, namely the theoretical, research and methodology, and the research parts (presentation of research findings, including discussion and proposals for action). Accordingly, the below section of the review report, following the preliminary reflections, also consists of three parts.

I consider the first part (pages from 8 to 73), entitled *Knowledge in the Research Field – Review of the Literature* and regarded as the theoretical foundation of the dissertation, to comprise three separate chapters (i.e., 1.1, 1.2, and 1.3). Based on the correctly selected subject literature, the Doctoral Student clearly and coherently presents: what the inquiry process is; inquiry in general and in the teaching of the sciences in particular; the laboratory of the teaching of physics and the integration of inquiry activities; finally, the ‘Research Physics’ program for pupils.

(Given the role of reviewer entrusted to me), I think that as regards this part of the analyses and considerations, it is necessary to point out the weaknesses of its theoretical framework. The deficiencies consist, on the one hand, in the outdated character of some assumptions; on the other hand, in the fact that the created theoretical and terminological

apparatus only partially allows for further creative development of the theory, in particular its spatio-temporal contextualisation. I mean, among others:

- firstly, an explicit and synthetic attempt to address the mechanisms/factors that condition the effectiveness of teachers' teaching and pupils' learning in the aspect of, for example, contemporary transformations related to how the roles of the pupil and the teacher are perceived as regards taking joint responsibility for the realisation of the educational process;
- secondly, an attempt to analyse the most significant phenomena related to the changes in the socio-cultural environment and its impact on the construction of teacher and pupil identity;
- thirdly, presenting analyses, conclusions and generalizations on the currentness of ideas and processes that condition the effectiveness of the teaching process in the contemporary social reality (and its educational, practical reflection); despite the fact that socio-cultural development gives rise to new problems.

Evaluating this part of the dissertation, I emphasize that the logic of narration is determined by the issues related to the teaching process (also as a social phenomenon) and to the development of the educational subject. I consider both perspectives valuable for pedagogy. Thus:

- firstly, the Author correctly pointed out that, both in theory and in practice, the didactics that neither crosses its own borders as a discipline/field, nor uses achievements of humanities and social sciences can be *powerless* as an instrument of description, understanding, or a tool meant to prepare for action. Simultaneously, the phenomena of interest to the discipline cannot be excluded - without the risk of their deformation - from the agenda of areas of science which fall into the above-mentioned disciplines. Thus, the problems analysed in the first part of the dissertation include issues related to determining the status of the educational agenda, its relation to other forms of social order, its constitutive parts and essential conditions. Indeed, the frequently adopted narrow pedagogical optics relies mainly on the experience of educational practice and the findings of pedagogical thought. However, among others, didactics and pedeutology need to be enriched with a broader optics, which presupposes a wider and deeper use of cognitive options used in other sciences about man;
- secondly, the value of the analysed part, and at the same time the Doctoral Student's achievement, is the attempt at an interdisciplinary, transdisciplinary, and future-oriented

grasp of *intellectual activity and the shaping of thinking about teaching and learning* (in the aspect of theory and practice) with multilayer conditions. Simultaneously, it is worth noting that the Doctoral Student in a meaningful way included contents concerning pedagogical (but also social) activity in the aspect of shaping and improving the quality of pupils' and students' life. These contents make one aware of the complexity of the analyzed problems and seem to emphasize that all the activities related to the formation of the intellectual sphere cannot be accidental or occasional;

- thirdly, Ms. Michal Sigron focuses her understanding of the culture of teaching and learning (education) on the notions of causality, action, attitude, personality, person, and brings up their exploratory power. She goes beyond the narrow, often reductionist limits of approaches used in social sciences, beyond the categories of attitudes and actions characteristic of behavioural tendencies. This implies interpreting the culture of education in socio-axiological categories, e.g., in the needs and obligations that function in the world of values, including science.

The first part of the dissertation is written in a communicative way. It relates to the literature of the raised problems, comprising very broad and multi-threaded overviews of this literature. This part already can be treated as an important research element of the dissertation. The clearly outlined educational and social perspective (in terms of the theoretical threads referred to) as well as the analysis of the findings of previous studies determined the Doctoral Student's thinking at the research stage, and created the basis for the analysis and interpretation of the results obtained. The attempt to show mutual relations between different educational realities testifies to the Author's reliability and intellectual honesty - especially in light of scientific research, concepts and results of theoretical and empirical studies (often contradictory or mutually exclusive).

I consider the second part (chapter two, pages from 8 to 73) - belonging to the research and methodology part of the dissertation - to comprise eight separate chapters. Relying on the literature of the subject, Ms. Michal Sigron, presents the methodological foundations of her own study in a coherent, competent, and multi-dimensional way.

The Author thoroughly and accurately presented subsequent stages of constructing the research process: from the formulation of the problems to the justification of method choices and the way in which the results were analysed. She writes: *The aim of this descriptive research is to portray the students' perception of the processes that they undergo in the 'Research Physics' program during the different stages of the three-year program, in particular: 1) To*

*portray the students' perceptions with regard to the different inquiry practices they have experienced, challenges they have faced, and their development in these inquiry practices, and to identify the relationship between development, experience, and challenge. 2) To map their views with regard to the inquiry process and to the learning environment in which they operate in the 'Research Physics' program (e.g., roles of students and teachers and learning resources provided). In particular, their view of the affordances and barriers of this learning environment to the completion of their research work and their personal growth (p. 75).*

The Doctoral Student formulated the following research problems: 1. *How did students' perception of their development relate to their perception of the experience and challenge in performing various inquiry components along the stage of the 'Research Physics' Program? 2. How did student perceive the learning environment in the 'Research Physics' program along their engagement in the various stages of the inquiry work? In particular: roles of students and teachers and learning resources (p. 78).*

To summarise this part of the dissertation, I would like to emphasize that the structure of the methodological part is correct. The Author correctly operates the basic terminology, tries to avoid complex and ambiguous formulations, which makes the text clear and reliable. In the conducted project, she conducted studies on a specific socio-educational system. Simultaneously, it is worth emphasizing that the studies consisted not only in particular research activities, but in a 'particular' way of organising data (noticeable in light of the obtained results) that allows for emphasizing the characteristics of the above-mentioned system. The analysis of the methodological part of the dissertation reveals also that Ms. Michal Sigron was fully aware that the taken methodological decisions are not neutral; starting from the construction of the research concept, through the selection of methods and techniques, and ending with the analysis of the gathered material. These decisions were conscious, preceded by an analysis of possible consequences, and overt, as they directly referred to the type and quality of the gathered material, the accuracy of assessments/opinions/ conclusions. First of all, however, the decisions affected the kind of judgements that can be formulated on their basis, what they can be used for, and to what extent they can be related to theory and to socio-educational practice.

The last, third part of the dissertation (pages 102-368, as well as the discussion and references on pages 185-191) is devoted to the presentation and analysis of the empirical results obtained during the conducted, author's own research. The presented material is cognitively interesting.

Ms. Michal Sigron moves freely within the issues presented in this part of the dissertation. She competently refers to the presented results, and occasionally - which I consider to be the 'added value' of the work - presents her stance on the statistical values. I understand this as the involvement of the researcher, who is simultaneously a representative/an advocate of the studied group. It is also important that the gathered empirical material is systematised and it attempts to refer to the existing theories and to embed the analysis of results in the achievements of various disciplines and subdisciplines of pedagogy (in particular pedeutology and didactics).

Several parts of the study reveal that the Author's prior knowledge had influence on the analysis and interpretation of the study results, which I think speaks in favour of the researcher. They make up to generally stated regularities, reflections which can be used as an additional message justifying the reliability of the (indirectly) formulated suppositions and judgements. This contributed to a richer, more reliable and complete interpretation of the analysis and propositions.

An insufficiency may be felt when it comes to the indicated proposals for educational and pedagogical theories. Referring to the possible practical goal of the research, the dissertation could be enriched with, for example, a specific system of assumptions, concepts, and relationships between them, allowing to approximately describe (to model) some aspect of reality. Such a model (in the perspective of its practical use) could have specific functions, for example, regulatory and instrumental ones.

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The bibliography consists of over 150 entries presented in a traditional, ordered layout (pages from 398 to 406). It contains cited and simultaneously scientific texts (Israeli and foreign) representative for the problems addressed in the reviewed dissertation.

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At the end of this review, I would like to emphasize that the dissertation has a significant cognitive value. It has an interdisciplinary character, is coherent and logical, and its particular fragments constitute independent wholes which simultaneously complement one another. The analysis and presentation of research results are, mostly, convincing; and, given the research



procedure adopted in the dissertation, the Author achieved the theoretical and cognitive research objective set at the beginning of the study. The research enriches the knowledge on the activities of subjects of educational life as a form of being in the research space, and thus space-related sensations and experiences.

It is also worth noting that:

- (by performing a multifaceted analysis of particular areas of teaching/learning and spaces of educational interactions) the Doctoral Student avoided a one-sided approach to individual areas of interest to pedagogical sciences and at the same time coherently and precisely formulated and presented her thoughts;
- the Doctoral Student analysed the contemporary educational space (of the teaching/learning process) from the perspective of responsibility for the future of a human - a young participant of socio-educational life (especially that the primary objective of educational activity is, among others, the feeling of personal responsibility for one's own actions). At the same time, she indirectly signalled what constitutes the source of this concept, its theoretical inspiration (e.g., subjective and social responsibility).
- Ms. Michal Sigrón situates the dissertation contents within a deliberate and conscious process of *education* and, what is important for any research formation, in any environment.

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In conclusion, I state with full responsibility that the research problem set by the Doctoral Student was solved in a substantively correct way. From the scientific and socio-educational point of view, the dissertation is an important study and an undeniable contribution of the Author to the further development and expansion of research fields in contemporary social sciences, especially in pedagogy. I think that it clearly shows that the positive reception of, among other things, teaching/learning, seems to be an extremely useful 'tool' for studying the role of pedagogy in conditions of dynamic socio-cultural transformations.

I treat both the debatable and polemical suggestions and observations, as well as the questions of a subjective nature that are presented in this review report not as a means to discredit what I consider to be a valuable dissertation, but as a voice in discussion.

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The doctoral student meets all the conditions set out in the Act on Academic Title and Scientific Degrees of 14 March 2003, with additions contained in the Act of 27 July 2005, Law on Higher Education, as well as the amendment to the Act of 18 March 2011.

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**I am in favour of accepting the dissertation and recommend that the Candidate is admitted to further stages of the initiated doctoral programme.**

A handwritten signature in blue ink, appearing to read 'M. Kowalski', with a large, sweeping flourish extending to the left.