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Personalities of Slovak Mathematics - inspiration for future mathematics education

Within the framework of the project KEGA "Prominent personality of Slovak Mathematics – idols for future generations", we are compiling biographies of Slovak mathematicians as an inspiration for students – future teachers of mathematics at secondary schools. In our contribution, the personalities of prof. L. Bukovsky, prof. M. Hejny, prof. S. Jendrol, prof. R. Fric will be presented. These professors were also active in preparing future teachers of mathematics, they support several mathematical competitions such as mathematical Olympiad in Slovakia and Czech Republic.

Personality of professor Milan Hejný

Professor Milan Hejný, who worked at the Faculty of Education of Charles University in Prague for a long time, was inspired by educational activities and theory of his father Vít Hejný. He started to work in the field of mathematics education around 1970, when he made many experiments with his son. This is possible to see from his dialogue with his son Misko. He argues that up to this time he had 16 mathematics publications. He used in this dialogue of course the name of cars from socialist Czechoslovakia – Trabant, Skoda.

We lived on elevated ground floor. It was freezing winter behind the windows, so when we were going to bed, it had been pitch black for some time. The only source of light nearby was the streetlight above the parking lot. Five out of six spaces were occupied. We decided to count cars to fall asleep. After we had counted them, we were not much more tired, so we named them: brown Trabant, red Skoda, … Suddenly the door of the brown Trabant opened and an older man sat behind the wheel and left the parking lot. I asked Misko, who was not yet asleep by any chance: "Misko, how many cars are left?" He reached out his hand with all five fingers straight and asked: "Which one has left?" I looked out the window and said that the red Skoda is missing. He bent the index finger thinking and delivered judgment: "There are four cars." As he said that, I realised that I had mixed up the cars and the one that left was actually a brown Trabant. After passing that information on to my son, I expected a quick reaction but that did not happen. For a second, I thought he had finally fallen asleep, but suddenly his index finger went up and his middle finger down. After a few moments he shouted triumphantly:

Siller, H.-S., Weigel, W. & Wörler, J. F. (Hrsg.). *Beiträge zum Mathematikunterricht 2020.* Münster: WTM-Verlag, 2020.
doi: 10.37626/GA9783959871402.0

"Four, of course four." When I told my father about my little experiment, he praised me. Maybe this was the key moment that made me move from mathematics to didactics of mathematics.

He proposed his theory (see Hejný et al., 2006) using isolated and generic models. Isolated models have the following four characteristics:

1. The first particular experience, the first isolated models (cars) are developed and this is a source of new knowledge.

2. It is better to use more isolated models, which at this stage are separate.

3. Some models begin to refer to each other and create a group. Pupils in class can discover that these models are similar.

4. Pupils inquire in the last stage correspondence between any two models. These models create a community.

This stage ends with the creation of the community of isolated models. In the future, other isolated models will come to a pupil's mind, but they will not influence the birth of the generic model. They will only differentiate more detail in it.

Generic models are placed over the isolated models indicating its greater universality. The generic model is created from the community of its isolated models and has two basic relations to this community:

1) it denotes both the core of this community and the core of relation between individual models and

2) it is an example of all its isolated models.

The first relation denotes the construction of the generic model, the second denotes the way the model works.

Fingers are for many pupils generic model or counter.

The scheme of the process of gaining knowledge has three stages. In the first stage, there are motivation and isolated models, in the second stage, there are generic models, and in the third and final stage there are abstract knowledge and crystallisation. The move through the stages follows this:

isolated models $\Rightarrow$ generic model(s) $\Rightarrow$ abstract knowledge.

It is possible that Misko knew how to add different numbers later on without fingers in the abstract stage.

Personality of Stanislav Jendro

Professor Stanislav Jendro is a worldwide renowned scientist in graph theory and a leading person of the Slovak School of Discrete Mathematics. He has

been working at the Faculty of Nature Science at Pavol Jozef Šafárik University in Košice for more than 40 years,. His research interests cover several branches of mathematics, in particular the combinatorial properties of polyhedra, chromatic and topological graph theory, weighted graph, problem of graph circles, and the application of graph theory in chemistry and computer science. He has significantly contributed to the characterization of face and vertex vectors of polyhedra and polyhedral maps. He first discovered an example of a polyhedron with a non-involutional autoduality, which is named after him (Jendrol polyhedron), and subsequently characterized groups of automorphisms of autodial polyhedra. He solved the problem, motivated by theoretical chemistry, of the existence of molecules with a fulleroids structure and a prescribed group of symmetry. He has also published many major contributions on cyclic chromatic numbers, various variations of facial colouring of planar graphs, and types of irregularity strengths and colourings of graphs.

Professor Jendro made a significant contribution to the development of quality PhD. education in the field of Discrete Mathematics in Slovakia. The Košice combinatorial seminar has been organized regularly for more than 45 years. Likewise, the workshop „Cycles and Colourings“ (significant in Eastern Europe) has been successfully organized for 27 years.

Spoken in his own words, Professor Jendrol was charmed by the educational methods of Vít Hejný, whom he had met in person, and Hejny significantly helped him with didactic educational practices and with improving presentation. In his opinion, it is important that teachers take interest in their students, know how to engage their attention and have time for them after class. The teacher should guide his students to independence, provide them only with potential problematical situations, tasks and provide them with only particular „mathematical tools“ for solving the problem.

Personality of Lev Bukovský

Professor Lev Bukovský belongs to the greatest personalities of Slovak current mathematics. His scientific research is focused on set theory and mathematical logic with an emphasis on applications in other mathematical disciplines. One of his first results on the inductive enhancement of cardinal numbers using the gimel function of 1965 became a standard part of set theory textbooks worldwide. In 1977, he published a scientific work about generic models concerning the real line, in which he first introduced the cardinal invariants of the Lebesgue measure and the Bair category. They became part of the well-known Cichoń diagram, a traditional tool of theoretic set topology.

Around the year 1985, he founded a seminar about Set Theory, which became known as the Košice School of Set Theory. The newly founded seminar was from set theory, but mostly preponderate infinite combinatorics, topology and later the theory of real functions. Participants of the seminar have partially been changing, but the seminar lives on to this day. We can say without any doubt that for the last 10 years the seminar has been operating on a high professional level and that his members have been achieving great scientific results.

Professor Bukovský stands by his opinion that, for high-quality mathematical education, high-quality mathematical training for future teachers is necessary as well.

He was able to prove and assert these opinions and make mathematical educations greater, because he worked for many years (1999-2010) in the Accreditation Commission, an advisory board to the Ministry of Education of the Slovak Republic and was chairman of working group for mathematics. He has been working with high school mathematical talents for many years and was a member of the Central Committee of the Mathematical Olympiad from 1978 to 1983 and co-authored several teaching texts on the preparation of gifted students for solving tasks from the Mathematical Olympiad.

These were just few prominent living figures who significantly enriched and contributed to development of mathematics and to education of the next well-known generation of mathematicians not only from Slovakia.

Remark: Materials are drawn from personal interviews and upcoming book publications on the lives of above-mentioned Slovak mathematicians (see also Gunčaga, Tkačik, 2019).

Acknowledgement: Supported by grant KEGA 020KU-4/2018 „Prominent personality of Slovak Mathematics-idols for future generations“ (Ján Gunčaga, Faculty of Education, Comenius University in Bratislava, Štefan Tkačik, Faculty of Education, Catholic University in Ružomberok)

Literatur

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