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JACEK DYMEL (Kraków, Poland)

## A commentary to Szurek's article

*First learn the rules – and then break them, forget them.*  
Lester Bowie

My commentary to the article *Utopian Mathematics* by prof. Michał Szurek presents a teacher's point of view.

The term *utopia*, taken from Thomas More's Utopia essay, is ambiguous. On the one hand, it can be derived from the Greek *ou-tópos*, which means "not a place" or "nowhere". On the other hand, its origin may be the word *eutopia* meaning "a good place". I think this ambiguity of the word *utopia* actually shows what Michał Szurek's paper is all about: the author shows an interesting and engaging mathematics which is, however, absent in our school teaching. He uses the term *utopian* perversely, because in fact he proposes to introduce this "utopian mathematics" to its proper place, i.e., into school and academic teaching. To me – a teacher – the author's vision is captivating and colorful.

Is there a good place, however, proposed by prof. Michał Szurek solutions? It may seem that there is no climate for such ideas: the core curriculum is very unfavorable, students are not accustomed to this way of thinking, teachers are not educated in this direction, and academic staff do not often talk about this in the preparation for school work. The creators of the core curriculum of mathematics teaching and authors of exam problems are well aware of the utopian character of the postulate of teaching mathematics according to Michał Szurek. Basic school final test questions and high school final exam sets consist only of clichéd problems that do not require any new idea and solving them is

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Key words: beautiful mathematics, core curriculum, creative thinking, teaching mathematics – teaching schematic procedures, passionate teachers.

reduced to recreating one of the dozens of schemes trained in class. So, is there no hope?

However, there are many teachers (me too) who teach the lesson in two ways: on the one hand, they train boring, purely technical exam problems, and at the same time they try to show interesting, Olympic mathematics, which is rather not applicable at school exams. We make hypotheses, verify them, look for analogies and similarities between problems and theorems. It goes without saying that it is very difficult to verify your ability to pose problems on an exam basis. But it seems that the author of the article does not really want to check the skills acquired in this way. The essence is the postulate that we also start teaching mathematics, instead of just teaching schematic procedures, because only such teaching will let the students find themselves in the modern world.

Godfrey Hardy wrote:

The mathematician's patterns, like the painter's or the poet's must be beautiful; the ideas like the colours or the words, must fit together in a harmonious way. Beauty is the first test: there is no permanent place in the world for ugly mathematics.

G. H. Hardy

Michał Szurek in his article and rich publishing output shows that mathematics is beautiful, it can and must be beautifully taught. Through this beautiful mathematics, you can actually sensitize young people to independent and creative thinking.

Lester Bowie, an outstanding jazz trumpeter, cited at the beginning of my commentary, a member of the avant-garde formation Art Ensemble of Chicago, combining music styles from free jazz to classical music of the 20th century, said:

The most important thing about jazz is something that people don't understand, namely: jazz is not what you play, but how you play it. The material is unimportant, it can come from various sources (...) But jazz itself is a concept. It's not just a repertoire – it's a way of acting, a way of thinking.

Bowie, 2012, 55:40-56:09.

In place of the word jazz, let's substitute the word mathematics and we will find a great resemblance to the teaching philosophy of Michał Szurek pointing to the important connections between the artist and the mathematician or also the teacher of mathematics. Because teaching mathematics is essentially an art, not just a craft.

Fortunately, students are still open and curious about the world, there are still plenty of passionate teachers, and many scholars are strongly involved and want to help realize this vision of the author of the article. Reading the article by Michał Szurek, I was most impressed by the *parallelogram of the centers*. Most of the issues are known to me, but their combination with each other and what results from this combination means that we read and learn an intriguing story, full of unexpected transitions and amazing relationships. This is how you would like to teach and talk about mathematics.

So let's approach teaching by astonishing ourselves and students with new, undiscovered issues, asking questions. Especially, when we don't know the answer. Let's also be fascinated with well-known problems seen in a new context, linked with other branches of mathematics, physics or social sciences.

Olga Tokarczuk in her Nobel lecture on December 7, 2019 read her essay *Sensitive Narrator*. And there she said:

How we think about the world and – more importantly – how we talk about it, is of great importance. Something that happens and is not told ceases to exist and dies.

Today, the problem seems to be that we do not have ready narratives, not only for the future, but even for specific “now”, for the ultrafast changes of today's world. We lack language, viewpoints, metaphors, myths and new fairy tales. We are witnessing, however, how these misaligned, rusty and anachronistic old narratives are being attempted to join the vision of the future, maybe assuming that better is old something than new nothing, or trying to cope with the limits one's own horizons. In a word – we lack new ways to talk about the world.

Tokarczuk, 2019.

And just prof. Michał Szurek talks in a new way about the world of mathematics and, more importantly, shows how to show it. Let's do everything to make “Utopian Mathematics” find its good place in our schools.

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Odniesienie do artykułu *Matematyka utopijna*  
prof. Michała Szurka

S t r e s z c z e n i e

Ponieważ jestem nauczycielem, mój tekst będzie odniesieniem do artykułu *Matematyka utopijna* prof. Michała Szurka z punktu widzenia nauczyciela.

Rozpocznę swój tekst znaczenia terminu *utopia*, który pochodzi z eseju *Utopia* Tomasza More'a. Jest to termin niejednoznaczny. Z jednej strony może pochodzić od greckich słów *out opos*, co oznacza *miejsce, którego nie ma*, a z drugiej strony może pochodzić od słowa *eutopia*, które oznacza *dobre miejsce*. Chyba ta dwuznaczność słowa *utopia* pokazuje w istocie to, o co chodzi Michałowi Szurkowi: pokazuje matematykę interesującą, ciekawą i wciągającą, która jednak nie ma swojego miejsca – w domyśle – w naszym nauczaniu szkolnym. Michał Szurek używa określenia *matematyka utopijna* przewrotnie, bo w istocie proponuje wprowadzić tę utopię na właściwe dla niej miejsce, czyli do nauczania szkolnego i akademickiego.

Czy jest jednak *dobre miejsce* na proponowane przez prof. Michała Szurka rozwiązania? Może się wydawać, że nie ma klimatu dla takich pomysłów: podstawa programowa jest bardzo niesprzyjająca, uczniowie nie są przyzwyczajeni do takiego sposobu myślenia, nauczycieli raczej się w tym kierunku nie kształci, a i pracownicy naukowci nieczęsto o tym mówią na zajęciach przygotowujących do pracy w szkole. Z utopijnego charakteru postulatu nauczania *matematyki wg Michała Szurka* doskonale zdają sobie sprawę twórcy podstaw programowych nauczania matematyki oraz autorzy zadań egzaminacyjnych. Czy więc nie ma nadziei?

Jednak jest wielu nauczycieli (ja także), którzy prowadzą lekcję dwutorowo: z jednej strony trenują nudne, nieciekawe, o charakterze czysto technicznym zadania maturalne, a jednocześnie starają się pokazać matematykę interesującą, ciekawą, olimpijską, która raczej nie ma zastosowania na egzaminach szkolnych. Stawiamy hipotezy, weryfikujemy je, szukamy analogii i podobieństw między zadaniami i twierdzeniami. Jest rzeczą oczywistą, że bardzo trudno zweryfikować umiejętność stawiania problemów na gruncie egzaminacyjnym. Ale wydaje się, że w istocie nie chodzi autorowi artykułu o to, by sprawdzać nabyte tą drogą umiejętności. Istotą jest postulat, abyśmy zaczęli uczyć także matematyki, zamiast tylko uczyć schematów, gdyż jedynie takie nauczanie pozwoli się odnaleźć we współczesnym świecie.

*Vth High Schooll*

*Krakow*

*Poland*

e-mail: *jacek.dymel@gmail.com*