REVIEW

in connection with a competition for the **Professor** election procedure
in Higher Education: 1. Pedagogical Sciences
Professional field: 1.3 Pedagogy of teaching in ...(Methodology of teaching mathematics in primary grades)
for the needs of the Sofia University "St. Kliment Ohridski"
Faculty of Education Sciences and Arts

1. General presentation of the procedure

The State Gazette No. 96 of November 19, 2021 announced a competition for the election of a "Professor" in Professional Field 1.3. Pedagogy of Education in ... (Methodology of Mathematics Education in Primary Grades) for the needs of the Faculty of Educational Studies and The Arts (FESA) at the Sofia University "Kliment Ohridski" (SU). The only candidate in the competition is Associate Professor Dr. Gabriela Nikolova Kirova. This review was prepared on the basis of Order No. РД-38-3 / January 4, 2022 of the Rector of the Sofia University "St. Kliment Ohridski" (SU) – Prof. Dr. Anastas Gerdzhikov, on the basis of the decision of the Admission Committee, appointed by Order No. РД-38-2 / January 4, 2022 of the Rector. By the Record of January 21, 2022 the Commission has unanimously established that all the necessary documents for participation in the competition according to Article 107 (1) of the Regulations on the Conditions and Procedure for Acquiring Scientific Degrees and Holding Academic Positions at the SU "St. Kliment Ochridski" are present and has admitted the candidate to the competition. On the basis of the Minutes of the first meeting of the Scientific Jury of January 27, 2022 the admission of the candidate to the evaluation was verified in accordance with the minimum national requirements and the additional requirements of the Sofia University pursuant to Article 105(4) of the Regulations on the Conditions and Procedure for Acquiring Scientific Degrees and Holding Academic Positions at the SU "St. Kliment Ochridski". The Scientific Jury has verified that the reference submitted by the applicant complies with the minimum national requirements and with the additional requirements of Article 105(4) and (5) of the Regulations on the Conditions and Procedure for Acquiring Scientific Degrees and Holding Academic Positions at the Sofia University "St. Kliment Ochridski". The Scientific Jury has unanimously decided that the candidate meets the minimum national requirements under Article 25(2) and (3) of the Law on the Development of the Academic Staff in the Republic of Bulgaria on the basis of all the documents submitted by the candidate. There is no evidence of plagiarism in the scientific works.

As a member of the Scientific Jury, I have found no procedural violations. I obtained access to the documents and materials of the only candidate in the competition, Associate Professor Dr. Gabriela Nikolova Kirova, which are accurately formatted and give basis for an objective and complete evaluation in accordance with the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations for its application, as well as the Regulations of the Sofia University and the Faculty of Educational Studies and The Arts.

2. General presentation of the candidate

I have known my colleague Associate Professor Gabriela Kirova since the beginning of her academic career at the Faculty of Preschool and Primary School Education. For almost 28 years we have worked in the same sector (mathematics education) of the same department

(Primary School Pedagogy). This fact allows me to claim that I have a broad view of her biography in at least three directions – as a teacher, as a researcher and as an organizer of the learning process. In 1986 Gabriela Kirova graduated from the Faculty of Philosophy of the Sofia University "St. Kliment Ohridski", majoring *in Pedagogy* with a qualification of *Pedagogue and full-time lecturer with an additional major in Philosophy*. After successfully passing a competitive exam, by the order of the Rector of Sofia University as of the end of 1987 she was appointed as an assistant professor in Methodology of Mathematics Education at the Department of Primary School Pedagogy at the Faculty of Children and Primary Teachers (today Faculty of Educational Studies and The Arts) of the Sofia University "St. Kliment Ohridski". In time, she successively acquired the subsequent titles of "Senior Assistant" and "Chief Assistant". From 2004 to 2007 she was a doctoral student in the Didactics of Mathematics at the Department of Primary School Pedagogy. In 2013, after a successful defence of her dissertation thesis entitled: "The thematic diversity of text problems in mathematics for the primary grades" she received the educational and scientific degree "Doctor". In 2015, after a successful competition for an academic position, Sofia University granted Gabriela Nikolova Kirova the position of Associate Professor in the field 1.3. Pedagogy of teaching in …(Methodology of teaching mathematics in primary classes). Since the same year she has also been Head of the Department of Primary School Pedagogy. Since the beginning of her leadership Associate Professor Kirova took active steps for the academic growth of the teachers of the department. Along with the competitions for habilitation, competitions for assistant professors in various fields were announced, which filled and renewed the academic staff of the department. Associate Professor Kirova is also an excellent organizer. She has been successfully managing, for 7 years now, the complex organization of the teaching process that the department is charged with to conduct within the faculty. She is proactive and able to engage colleagues and students in activities to renew and improve teaching in the primary grades. Back in 2012, she organized a Student Research Forum with participation of both students and professors. The proceedings of the forum are reviewed and published in a special collection. Editing of the papers in the proceedings is also her work. Until 2019 (the beginning of the Covid crisis), the forum has 7 editions. Associate Professor Kirova has already 34 years of work experience and a rich professional biography dedicated to the methodological training in mathematics of students – future primary school teachers. She speaks four languages – Russian, French, Greek, English. She has excellent computer skills. Associate Professor Kirova is a true teacher and a wonderful colleague. She is demanding and supportive of students and responsive to anyone interested in teaching Mathematics in elementary school.

3. Presentation of the candidate's scientific production

Associate Professor Dr. Gabriela Kirova conducts in-depth research work in the area of mathematics education in the primary grades. The results of her research are reflected in the large number of publications on the subject. The scientific output includes a total of 147 works, including 3 monographs, 91 articles, 3 studies, 7 textbooks and 34 teaching aids. For participation in the competition Associate Professor Kirova has proposed 1 habilitation work – monograph (indicator C. 3), 1 article published in a scientific journal, refereed and indexed in world-known databases of scientific information (indicator D.6), 23 articles reports published in non-refereed journals with scientific peer review or published in edited collective works (indicator D.7), 3 studies published in non-refereed peer-reviewed journals or published in edited collective volumes (indicator D.9), 6 university textbooks used in the school network (indicator F.20), 14 university textbooks or teaching aids used in the school network (indicator F.21).

In the habilitation thesis (C.3.1) **Kirova, G.** (2021) *The training of students, future primary school teachers, to work with text problems in mathematics*, an extensive study is made on the methodological training in mathematics of elementary teachers and, in particular, on their competencies for methodologically correct teaching of text problems in elementary grades. The ideas presented in the monograph are derived from the author's extensive theoretical and practical experience and analysis of the issue of text problems in current practice (80 mathematics lessons in primary classes were observed and analysed in the period 2010-2016). A modern didactic model for working with text problems has been developed and implemented in face-to-face and online form through lectures, video lessons and tests. The model contains a methodological elaboration of all 859 text problems and creative exercises over text problems in one of the teaching sets of mathematics for the primary stage of basic education, on which many schools in the country work. (Associate Professor Kirova is one of the authors of the textbooks in question.) Experimental training was conducted with students, future primary school teachers, (904 participants) on the new didactic model and statistical processing of the research results was done. By means of Ludwig's test for samples of more than 200 people the effectiveness of the applied model was confirmed. The volume of the monograph is 319 pages, in which 39 diagrams and 65 charts are included.

The topic of text problems in teaching mathematics in primary grades, as well as the application of mathematics in practical situations in the lives of pupils is also present in many articles or papers submitted for the competition by Associate Professor Kirova. In the publications (D.7.5), (D.7.9), (D.7.10), (D.7.12), (D.7.13), (D.7.14), (D.7.15), (D.7.20), (D.7.21), (D.7.22), (D.7.23) we can find research on a number of issues related to the study of text problems in different grades in primary school from the point of view of the competence approach in mathematics education. On the one hand, text problems are one of the important components of the mathematics curriculum and, on the other hand, research shows that text problems are difficult for a large percentage of pupils. The publications outline the problems and give methodological prescriptions for overcoming them, when studying this subject in the light of the ongoing educational reform. (In the latter reform, education, including mathematics education, is oriented towards the acquisition of basic competences in mathematics, science and technology.) This includes modelling practical situations with numbers and arithmetic operations and modelling specific life situations by composing text problems. Associate Professor Kirova also creates a kind of methodology for such learning activity by classifying the types of creative exercises over text problems in mathematics in primary grades. From the publications of Associate Professor Kirova we can learn how to teach pupils to compose cognitive text problems on numerical data from different sources (timetables, newspapers, encyclopaedias, internet (on football topic), "how to navigate on a map", "how to fill in tables with data", how to solve "problems without limits" (from the International Mathematics and Science Study – TIMSS), as well as other practical skills, the basis of which is mathematical modelling.

As already alluded to, in the research of Associate Professor Kirova, the competency approach is clearly evident, but I will now focus specifically on two important components of fourth grade pupils' overall mathematical competence. These are the problems of finding the unknown diminutive and the unknown divisor in fourth grade mathematics education. The latter problems are of interest from both a practical and a scientific point of view. In the article (D.6.1) and the article (D.7.1) a **unified methodological approach** to the study of the topics "Finding an unknown diminutive" and "Finding an unknown divisor" is proposed and a methodological technology for its implementation is developed. The mathematical basis in this methodology is

the logical relationship (equivalence) between the actions of subtraction and addition and, respectively, division and multiplication. But the leading didactic idea in the proposed methodology is to bring to the fore **the analogy** between the actions of subtraction and division (on the basis of addition and multiplication). This analogy is very cleverly represented graphically by two original, interchangeable diagrams, in which it is clearly shown that, in going from subtraction to addition, the difference "becomes" the additive (first), the diminutive "becomes" the additive (second), and the diminutive "becomes" the sum (in the first diagram), and that, in going from division to multiplication, the quotient "becomes" the multiplier (first), the divisor "becomes" the multiplier (second), and the divisible "becomes" the product (in the second diagram). The proposed schemes visualize the logical relationships between arithmetic operations and provide a natural "derivation" of the rules for finding an unknown diminutive and an unknown divisor. In each of the articles, a thorough comparative analysis is made of the didactic technologies for studying the respective topic (unknown diminutive or unknown divisor) used in recent fourth grade mathematics textbooks. From this analysis the undeniable advantages of the new approach are also evident.

The competence approach is also found in the research of Associate Professor Kirova related to project work. Project work in the teaching of mathematics in primary grades is a modern didactic topic, which has no prototype in the current teaching practice. This topic is the subject of the research published in the articles (D.7.2), (D.7.7), (D.7.8), (D.7.13). Through them Associate Professor Kirova expresses the understanding that project work is a successful way to develop mathematical competences in pupils and in this regard conducts research work on the topic. It is clear from her publications that through project work pupils develop their communication skills, enrich their knowledge and conduct independent research activities related to collecting numerical data, composing and solving mathematical problems. Associate Professor Kirova recognizes the great cognitive importance of project work and she herself develops mathematical projects such as "Sofia – Capital of Bulgaria" or "The Room of Riddles" or "Mathematics from the Wonderful World of Disney" and others.

In the publications of Associate Professor Kirova we also find research related to or resulting directly from the modernization of school mathematics education carried out in recent years. In the articles (D.9.2), (D.9.3) a comparative analysis of the current 9 mathematics textbooks is made, in the article (D.7.3) a content analysis of an electronic mathematics textbook for the first grade is made, in the article (D.7.3) a didactically substantiated proposal is made for the inclusion of new teaching content in textbooks related to pie charts; In the article (D.7.16) a way of including Venn diagrams and Carroll diagrams in mathematics textbooks is proposed – an illustration that is present in the textbooks of Western European countries and facilitates the analysis and classification of information and contributes to the development of student thinking. In conclusion on this point, I can say that the scientific research work of Associate Professor Dr Gabriela Kirova is very rich and meaningful, the theoretical concepts put forward arise from actual practical problem situations and are directly oriented towards teaching practice.

4. **Presentation of the candidate's academic literature**

Associate Professor Kirova has a rich collection of educational literature. She has written 2 university textbooks and 4 textbooks used in the school network (indicator F.20), 14 university textbooks or teaching aids used in the school network (indicator F.21).

Book (F.20.1) Kirova, G. (2021) *Current Issues in the Didactics of Mathematics in the Primary Grades* is the newest textbook on the didactics of mathematics for the primary grades in the country. The book is 525 pages and contains 11 pages of references cited. The book presents

current issues of didactics of mathematics at primary school age developed in the author's lecture courses. Current trends and approaches in teaching mathematics in 1st to 4th grades are presented. The methodological problems and their solutions are presented in the light of the educational reform in Bulgaria and the implemented new curriculum standards in mathematics. Author's comparative studies of the new mathematics teaching kits for primary grades are also presented.

The book (F.20.2) Kirova, G. (2020) *Project Work in Mathematics Education in the Primary Grades* is designed for teachers and student, future primary school teachers. The theoretical part presents the nature, place, importance and methodology of project-based learning in mathematics in the primary grades. The practical part contains the developments of 11 author's projects, which have been tested in a real teaching process and can be applied in teaching practice.

The methodological ideas of Associate Professor Kirova find a deserved place in the new mathematics textbooks for the first, second, third and fourth grade – (F.20.3), (F.20.4), (F.20.5), (F.20.6), in which she is one of the authors (in the second position) of the five authors.

Associate Professor Kirova is also co-author of a number of textbooks designed to support the work of the teacher: in the conduct of elective mathematics classes in primary grades – (F.21.1), (F.21.6), (F.21.9), (F.21.10), (F.21.11); in the teaching of mathematics in the textbooks of the publishing house KLET – (F.21.2), (F.21.5), (F.21.9), (F.21.12),

Associate Professor Kirova has not missed the pupils – a collection of problems with three levels of difficulty (F.21.3), (F.21.7), (F.21.8), a collection of tests for preparation for the national external assessment (F.21.4) and a study guide with an integrative character for work during the summer holidays (F.21.13, F.21.14).

The fact that her books are popular among students of the specialties "Preschool and Primary School Pedagogy", "Primary School Pedagogy and Foreign Language", as well as among primary school teachers, speaks unequivocally for the quality of Associate Professor Kirova's educational literature.

5. Presentation of the candidate's teaching work

Since the beginning of her academic career, Associate Professor Gabriela Kirova has been conducting classes on teacher training, pedagogical practice and seminars on didactics of mathematics at the faculty. After defending her Ph.D., she was assigned lecture courses along with practicum courses. Along with the Faculty of Educational Studies and The Arts, she also lectures at the Faculty of Pedagogy of the Sofia University "St. Kliment Ohridski". As a confirmation of her rich and varied teaching activity, I will cite only the courses she has prepared since her habilitation. During this time (the last 7 years) she has developed lectures in a total of 7 courses – 3 compulsory, 1 elective and 3 optional. She lectures a total of 15 courses – 9 bachelor courses and 6 master courses. Here is a brief summary of the courses of Associate Professor Kirova: **Didactics of Mathematics** (compulsory course – two semesters) in the Bachelor's degrees of the specialties Primary school pedagogy with a foreign language and Preschool and primary school pedagogy, full-time and part-time studies; **Methodology of Mathematics Education in 1st to 4th grade** (compulsory course – one semester) in the Bachelor's degrees of the specialty Pedagogy, full-time and part-time studies; **Didactics of Mathematics – Contemporary Trends and Approaches** (compulsory course – one semester) in the Master's Degrees of Primary school pedagogy (graduates of pedagogical specialties and specialists with teaching qualification) and Primary school pedagogy (graduates of other specialties); **Creative work on text problems in mathematics in 1st to 4th grades** (elective course) in the undergraduate degree programmes of the Preschool and primary school pedagogy and Primary

school pedagogy with a foreign language, full-time and part-time studies; **Project work in mathematics education** (elective course) in the undergraduate degree programme of the Primary school pedagogy with a foreign language; **Diagnostics and external assessment of learning outcomes in primary grades** (elective course) in the Bachelor's degree of Preschool and primary school pedagogy; **Diagnostics and external assessment of learning outcomes in primary grades** (elective course) in the Master's degree of Primary school pedagogy (for graduates of pedagogical specialties and specialisations with teaching qualifications).

I would add that the Associate Professor Kirova's lectures are carefully prepared, methodologically sound and emotionally delivered. One part of them was videotaped even before the Covid crisis.

6. Presentation of the candidate's scientific and applied activity

Since 2015, for 7 years Associate Professor Dr. Gabriela Kirova has participated in 7 scientific projects – 6 under the Scientific Research Fund (5 projects at the SU "St. Kliment Ohridski" and 1 project at the Shumen University "Bishop Konstantin Preslavsky") and 1 national project. The projects are as follows: *Development of multimedia educational resources for electronic forms of distance learning*, SU – 2015, Team Member; *Resourcing of electronic courses for distance learning*, SU – 2016, Team Leader; *Study of learning outcomes in mathematics and science in 1st - 4th grade*, SU – 2017, Team Leader; *Exploring the Possibilities of Interactive Learning to Improve the Academic Performance of Students, Future Teachers*, SU – 2018, Team Member; *Applied Aspects of Preparing Students, Future Teachers, to Work with Electronic Resources,* SU – 2019, Project Leader; *Challenges of Competency-Based Education,* Shumen University – 2020, Team Member; National Project BG05M2OP001-2.002-0001 *Student Practices – Phase I –* October 31, 2016 – June 30k 2018 – Academic Mentor.

The reference shows that the scientific and applied activity of Associate Professor Dr. Gabriela Kirova is rich, diverse and oriented to current problems of teaching in primary grades. Also, she is a scientific supervisor of two colleagues – doctoral students, who have successfully defended the scientific and educational degree "Doctor".

7. Remarks and recommendations

I have no remarks on the scientific and applied and teaching activities of Associate Professor Kirova. I recommend her to continue to tirelessly transfer, both orally (lectures) and in writing (books), her knowledge, skills and competences in the field of mathematics teaching methodology to teachers and to students, future primary school teachers.

CONCLUSION

From the foregoing it is evident that Associate Professor Dr. Gabriela Nikolova Kirova is a proven specialist in the methodology of teaching mathematics in the primary grades with very rich research and teaching experience in this field. Her scientific production fulfils the minimum national requirements under Article 25, Paragraphs 2 and 3 of the Law on the Development of the Academic Staff in the Republic of Bulgaria for scientific area 1. Pedagogical sciences, professional field 1.3. Pedagogy of teaching in ... (Methodology of teaching mathematics in primary grades). With 550 points required, she provides evidence for 778 points. Her work has been cited numerous times. There is no reason to believe that they are not her own work, which rules out plagiarism. This leads me to conclude that her scientific, applied scientific and teaching activities and qualities satisfy the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, its Implementing Regulations and the Regulations of the Sofia University "St. Kliment Ohridski" for the development of academic staff, required of candidates

for the academic position of "professor". Therefore, in conclusion, **I give a positive assessment on the election as "Professor"** and I take the liberty to propose to the honourable members of the Scientific Jury to support this nomination and to make a proposal to the Faculty Council of the Faculty of Educational Studies and The Arts of the Sofia University "St. Kliment Ohridski" to elect Associate Professor Dr. Gabriela Nikolova Kirova as **"Professor of Mathematics Teaching Methodology in the Primary Grades"** with the conviction that she deserves it.

Sofia, 18 February 2022   The review has been made by:

(Prof. Dr. Zdravko Voutov Lalchev)