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**Review of the publication:
Andrew J. Milson, Ali Demirci,
Joseph J. Kerski
“International Perspectives on Teaching and
Learning with GIS in Secondary Schools”**

In many European countries, before the end of the first decade of the 21st century, crucial educational reforms were already implemented. The main instrument to influence teaching in schools seems to be curriculum reform. To fulfil the demands of a higher education learning environment, future teachers need to adapt to new competency and qualification trends. Therefore, these trends should be woven into the curriculum's content and structure. The aim of the review is to introduce the trends that can be applied in geography or homeland study education with GIS and geo-information technology support.

The publication *International Perspectives on Teaching and Learning with GIS in Secondary Schools* is an international comparative study of the use of geographic information systems (GIS) in secondary schools. It offers an unprecedented range of expert opinions on the educational value of GIS technology. Editors Milson, Demirci and Kerski, three GIS scholars, are the authors of the introductory chapter and the final synthesis chapter. Contributing authors of the remaining chapters are specialists in the area, and they present the use of GIS in relation to the national curriculum of 33 selected countries. Each chapter is divided into three sections – the first focuses on the description of the context of secondary education and GIS in the country, the second section focuses on a model or case study that illustrates using GIS, and the third section discusses related opportunities and challenges.

Some highlights mentioned in the publication are important to illustrate the fostering of a teacher's competencies when using GIS in secondary schools. This approach necessarily involves information (and ICT) literacy as a key component of lifelong learning. Moreover, student-centered pedagogy is required to improve learners' spatial literacy, which is crucial within geography education. Many chapters deal with options on how to improve those skills. Lifelong learning involves in-service training, hands-on training, workshops, seminars and courses, usually organized by teacher training institutes, the Ministry of National Education, universities or colleges.

The student-centered learning environment uses GIS as a problem-solving tool capable of developing the concept of spatial thinking. Activities focused on project-based learning, inquiry-based learning, game-based learning, collaborative learning, fieldwork and lab work are the most frequently mentioned in the content of the individual chapters. Additionally, contributing authors from Austria extend the concept of spatial citizenship adaptable for elementary education, which focuses competencies on communication, everyday orientation, and participation tasks.

Another important shift in teachers' qualification is the framework called 'Technological Pedagogical Content Knowledge (TPCK)', presented by Dutch contributing authors. This framework connects three main components of learning environments: content, pedagogy, and technology. It can be adapted to the needs of geography education as the GIS-TPCK model to present instruction on how to use GIS to stimulate progression in a student's geographic literacy.

The publication provides a significant shift towards understanding certain similarities between the selected countries in the field of geographical education with the use of information technologies, especially GIS, thus paving the way for international cooperation. On the other hand, significant differences have been revealed, such as a strong GIS education core in places such as Turkey, Norway, Taiwan and the UK compared to an insufficient computer infrastructure in Ghana, India and South Africa. In these countries, informed educators still promote geospa-

tial technologies and teach how to think spatially. Instead of teaching with GIS, they teach about GIS. In South Africa, teachers use transparencies and other non-computer (paper-based) tools.

The question is how to develop spatial literacy within elementary education as well. This concept involves the use of digital geospatial and geo-information technologies, namely online mapping services, virtual globes, satellite navigation systems (e.g. cross-curricular activity Geocaching) and, marginally, GIS as a supplemental game-based learning tool. A web-based learning environment turns out to be an acceptable, time saving option for teachers. Alternatively, ready-to-use teaching materials that use inquiry-based questions can engage students in meaningful issues.

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